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ABSTRACT

This publication contains 14 papers, most of which were written by instructors of higher education in Australia and Great Britain. Following an introduction, the first five papers are "The Development of Children's Map Ability" (Simon Catling), "Published Guidance to Pupils on Atlas Mapwork Skills" (Herbert Sandford), "Tactual Mapping and the Bold Atlas of Australia" (John Roberts), "Students' Ability to Transform Verbal and Visual Information" (Rod Gerber and Nea Stewart-Dore), "Children Talking to Learn," (Michael Williams). Using microcomputers in geography education is the subject of the sixth paper, "On Sitting Back and Letting It Happen: How to Be Unchained and Use Microcomputers in Geographical Education (Colin Davey). A case study in preservice teacher education is presented in paper number seven, "The Armidale Heritage Study: A Case Study in Applied Research in Pre-Service Teacher Education" (E.S. Elphick and Warren Halloway). The remaining papers are "Investigating the National Estate: Some Observations from an Implementation Study" (Colin Davey and Anthony Milne), and "Educational Materials and the Corporate Sector: Some Ideological Implications" (Jane Williamson), "Bias in Geography Textbooks" (John Fien), "Teaching Geography to Less-Able 11-14 Year Olds" (Graham Corney and Eleanor Rawling), "Attitudes and Approaches to Teaching Less Able Pupils in Year 8 Geography in Queensland" (John Fien, Rodney Gerber, and Peter Wilson), "Geography Methods Courses and Student Morale" (Anne Carter), and "Geography in the New Zealand Educational System and the Process of Curriculum Change" (Frances Slater). (LP)

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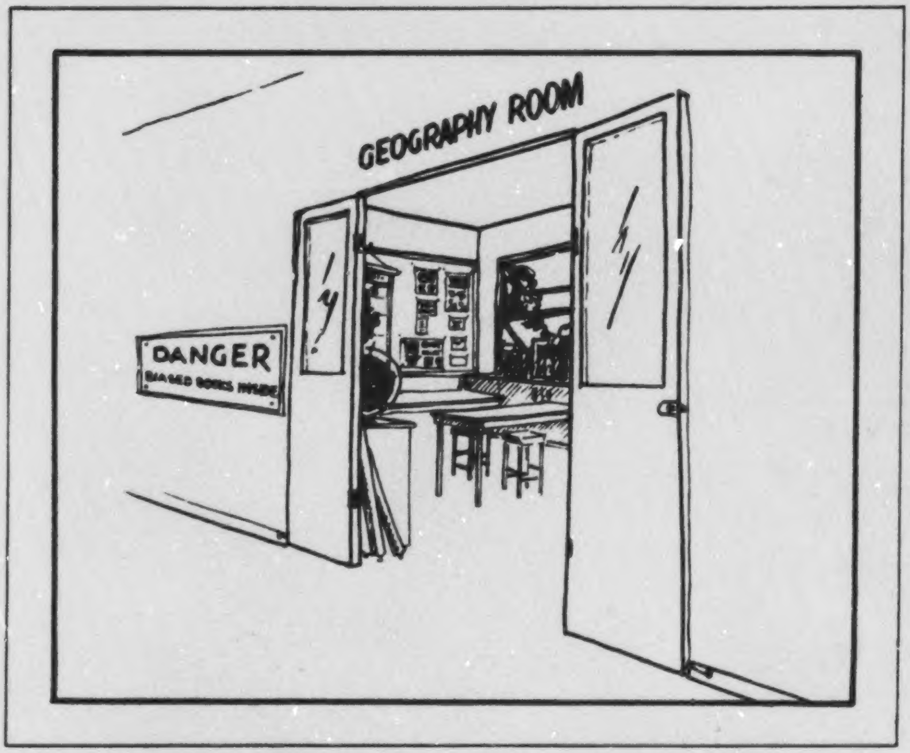
RESEARCH
IN
GEOGRAPHICAL EDUCATION
Volume 2



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Edited by

John Fien, Rod Gerber, Kevin Laws and Peter Wilson

AGERA

Australian Geographical Education Research Association

RESEARCH
IN
GEOGRAPHICAL EDUCATION
VOLUME 2

A collection of the papers
presented to the second national
meeting of the Australian
Geographical Research Association
at the Cambridge Inn, Sydney,
December 4 - 6, 1982

EDITED BY
JOHN FIEN, ROD GERBER, KEVIN LAWS AND PETER WILSON

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CONTENTS

Page

Contributors

INTRODUCTION
John Fien, Rodney Gerber, Kevin Laws, Peter Wilson 1

THE DEVELOPMENT OF CHILDREN'S MAP ABILITY
Simon Catling 3

PUBLISHED GUIDANCE TO PUPILS ON ATLAS MAPWORK SKILLS
Herbert Sandford 23

TACTUAL MAPPING AND THE BOLD ATLAS OF AUSTRALIA
John Roberts 44

STUDENTS' ABILITY TO TRANSFORM VERBAL AND VISUAL INFORMATION
Rod Gerber and Nea Stewart-Dore 60

CHILDREN TALKING TO LEARN
Michael Williams 90

ON SITTING BACK AND LETTING IT HAPPEN: HOW TO BE UNCHAINED AND USE MICROCOMPUTERS IN GEOGRAPHICAL EDUCATION
Colin Davey 104

THE ARMIDALE HERITAGE STUDY : A CASE STUDY IN APPLIED RESEARCH IN PRE-SERVICE TEACHER EDUCATION
E.S. Elphick and Warren Halloway 118

INVESTIGATING THE NATIONAL ESTATE : SOME OBSERVATIONS FROM AN IMPLEMENTATION STUDY
Colin Davey and Anthony Milne 135

EDUCATIONAL MATERIALS AND THE CORPORATE SECTOR : SOME IDEOLOGICAL IMPLICATIONS
Jane Williamson 154

BIAS IN GEOGRAPHY TEXTBOOKS : A REVIEW
John Fien 163

TEACHING GEOGRAPHY TO LESS-ABLE 11-14 YEAR OLDS
Graham Corney and Eleanor Rawling 185

ATTITUDES AND APPROACHES TO TEACHING LESS ABLE PUPILS IN YEAR 8 GEOGRAPHY IN QUEENSLAND
John Fien, Rodney Gerber and Peter Wilson 201

GEOGRAPHY METHOD COURSES AND STUDENT MORALE
Anne Carter 223

GEOGRAPHY IN THE NEW ZEALAND EDUCATIONAL SYSTEM AND THE PROCESS OF CURRICULUM CHANGE - SOME TRENDS AND CURRENT PROBLEMS
Frances Slater 236

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INTRODUCTION

Research in Geographical Education - Volume 2 is a collection of the papers submitted to the second national meeting of AGERA. It follows the precedent set after the inaugural national meeting in 1980. The popularity of this initial publication enhances our perception that there is a definite need to disseminate the results of quality research in geographical education widely. As well, the national meetings of AGERA seem to provide a much-needed forum for people to expose the considerable variety of research studies they have been undertaking throughout the world.

The international flavour of the initial AGERA publication has been maintained in this second volume, as has the variety of reported research studies. Papers included here have emanated from Australia and the United Kingdom. They have been written mainly by people working in the tertiary education sector, but who have strong links with primary and secondary schools.

The papers presented here are arranged into four categories:

1. studies in skills and different modes of communication
2. aspects about the use of resources in geographical education
3. considerations of the learner in geographical education and
4. curriculum change in geography.

Studies in skills and modes of communication include six papers which relate to the four basic modes of communication. Three papers deal specifically with maps. Simon Catling sheds new light on the nature of children's map ability. His synthesis may lead to the development of a theory of development of children's mapping ability. Herbert Sandford focuses on mapping skills which pupils usually develop from atlases. He considers the nature, extent and usefulness of the guidance on skill development which is offered by selected school atlases. John Roberts addresses the special case of maps the visually-handicapped users. He illustrates how an atlas can be designed especially for this group of map users. Rod Gerber and Nea Stewart-Dore link maps with verbal statements in an attempt to examine how children transform verbal information into visual/graphic information and vice versa. The oral mode of communication is the main consideration of Michael Williams' paper. Michael examines the functions of conversations in geography classrooms and suggests alternative roles for talking in geography lessons. Finally, Colin Davey explores the use of microcomputers in the geography classroom from a personal or experiential viewpoint. Colin suggests a four-fold process which may enhance the use of microcomputers in the geography classroom.

The section on the use of resources in geography contains four papers. The first of these details a heritage study in Armidale as an example of applied research in geography by teacher trainees. Warren Halloway and E. Elphick have used this study to develop a range of skills, knowledge and attitude about the Armidale (New South Wales) built environment which the trainees can use in their teaching. Colin Davey and Anthony Milne present the results of a study they conducted on the implementation of a kit of educational materials in the National Estate in selected Australian schools. Their findings should be useful for others preparing curriculum materials in geography. Jane Williamson investigates the production of educational resources by the corporate sector. Jane focuses on the materials produced by a large multinational mining company in Australia. Finally in this section, John Fien considers the nature of bias in geography textbooks. This paper, although basically a literature review, raises a number of issues on bias of which geography teachers should become aware.

The third section considers the learner in geographical education. Two papers focus on the less-able pupil and one considers student morale. Graham Corney and Eleanor Rawling report on the survey they conducted with English less-able students aged between eleven and fourteen years. John Fien, Rod Gerber and Peter Wilson report on a replication of this study to Year Eight students in Queensland, Australia. Finally, Sister Anne Carter investigates student morale in British geographical education method courses. Anne concludes that student morale is related to course aims and level of practicality in course presentation.

There is only one paper in the section on curriculum change in geography. It is by Frances Slater, who examines the redevelopment of the geography curriculum for Forms 5 to 7 in New Zealand. Frances draws a range of pertinent conclusions about the problems which these changes have produced for geographical education in New Zealand.

These papers reflect the commitment of AGERA members to improve geographical education through sensible research activities. Hopefully, they will stimulate contributions from other people in the future.

John Fien, Rod Gerber, Kevin Laws, Peter Wilson

THE DEVELOPMENT OF CHILDREN'S MAP ABILITY

Simon Catling*

Abstract

How realistic are teachers' expectations of children's abilities to read and to draw maps? A synthesis of recent research into children's development of mapping ability, map drawing and map reading skills begins to answer this question. Such a synthesis reveals how important it is for children to develop an understanding of the elements of maps to enable them to employ the concepts of maps successfully. Comprehensive statements on the desired expectations for the children's development of map reading and drawing skills should be helpful to teachers planning their mapping programmes. This synthesis may provide the beginning of a theory of development of children's mapping ability.

INTRODUCTION

If a thirteen year old was asked to draw a map of a classroom as part of an activity involving planning the repositioning of the main items of furniture, or of the way from home to the local shops to help a new neighbour find his way, what would we expect her to produce? A likely response is that we would wish to see a map in which the features are accurately located, reflecting the spatial layout of the area as if seen in plan perspective, whether those features are drawn in plan-view or are shown by symbols, these identified in a key. The features in the map would be accurately shown in proportion, the distances between them reflecting the reduction of scale, which would, perhaps, be shown by a scale bar. We would also expect the map to satisfy the purpose for which it was drawn.

The drawing of such a map is an activity which primary, middle and secondary school children may well, in a variety of guises, be requested to do. It

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may form part of the study of the locality, aimed at eliciting information for the children about their awareness of the local area (Stoltman, 1980), or it may be an introductory or diagnostic element in a mapwork course (Catling, 1978a). Whichever it be, it is likely that the teacher would hope that each child's map drawing would measure up to the expectations stated above. Likewise, children are often invited to use maps, either actively, to follow during a trail walk, or passively, perhaps as part of a mathematics textbook scale or grid exercise.

If the same child were asked to relate a teacher-drawn map of the classroom to the features in that room, or to describe what is shown in a few grid squares of a land-use map, what understanding would we anticipate that she requires in order to undertake either of these tasks? We would generally expect that she be able to perceive and read the symbols on the map, relating these to the features or concepts which they represent either in reality or to a generalised mental image, drawing on previous experience or reflection, and employing the key. The referencing of a symbol to the correct feature in the environment requires that the child is able to orientate the map, whether actually or mentally, and to locate symbols and features in the spatial field. For the child to appreciate the spatial form of the mapped area a similar ability to orientate oneself within the map is essential. Such aptitudes indicate that the child understands the perspective of the map as a representation of the landscape, and sees it holistically. Equally, if the task is well done, it is obvious that she recognizes the purpose of the map in hand and its limitations, and is aware of the scale of the map and can use it accurately.

These statements of what we would expect of a child's ability in map drawing and map reading introduce the three key points of this paper. Firstly, these examples identify the elements of understanding required to appreciate and utilize the map concept. Secondly, they are statements which presume achieved accuracy, understanding and quality of interpretation on the child's part. Thirdly, achieved capability implies learning founded in structured experience. The extent to which children may be capable of reaching these standards will be examined shortly, but initially it is important to examine the key ideas in understanding the concept map.

EXPECTATIONS IN MAPWORK

In the introductory statements of expectations of children's map drawing and reading five aspects of the map concept were identified. These are the elements of location and orientation, perspective, scale, symbolism and purpose. Maps are graphic representations (Robinson & Petchenik, 1976), structured by the spatial concepts of *location and orientation*; each feature, or expressed relationship, has a place, but its position can only be stated relative to another feature or relationship, or by way of a superimposed reference grid (Catling, 1978b). Unlike the depth perspective of a landscape picture, a map's *perspective* presents the landscape, or a selection of features or relationships from it, viewed as if looking down directly from above, showing the horizontal spatial form in two dimensions. The map provides a miniaturised view of the region portrayed, perhaps proportionally accurate or overtly able to be used for distance or area measurement: it is a *scaled* representation. What is included in the map is shown, not by the plan-view that is observed in a vertical aerial photograph but by a *symbol*, perhaps plan-shape, pictorial or purely abstract, which gives significance to what is shown. Naturally, it is not possible to show all the features of an area on any map of it, for this would create unnecessary clutter or 'noise'; and less can be shown as the scale of a map decreases. Thus a map is necessarily selective in the information it displays. Its content is defined by its *purpose*, which also will guide the nature of its style of presentation, whether topographical or topological, and its level of abstraction from the reality it portrays. In simplified form, Figure 1 summarises the characteristics of these elements of the map.

ELEMENT	DEFINITION
Location and Orientation	a. relative position: near to, far from, etc.
	b. absolute position: by grid reference (A4, 6385, lat. 62° 31' longt. 49° 26' 19").
	c. relative direction: left of, straight ahead, etc.
	d. absolute direction: north of, east-south-east of etc.
Perspective	e. viewpoint as if from above: plan-form.
	f. occupancy of horizontal space: site and area covered.
	g. projection: relation of earth-surface to plane paper
Scale	h. relative scale: proportion
	i. absolute scale: measurement from specific scale
Symbolism	j. pictorial symbol: drawing of particular feature
	k. iconic symbol: standardized pictogram (windmill, tree on O.S. 1:50,000 map)
	l. plan symbol: plan-form of feature
	m. abstract symbol: unrelated shape or colour (dot, square, etc.; green, brown, purple, etc.
Purpose	n. aim of map: road map, natural regions of world, etc.
	o. selectivity of content: choice of specific features or relationships
	p. abstraction from reality: showing relationships, etc. not readily identifiable in other ways.
	q. form of map: architect's plan, topological transformation, etc.

Figure 1. THE ELEMENTS OF THE MAP

That it is important for children to develop an understanding of elements of the map in order to be able to employ the concept map successfully is a view widely held (e.g. Fairgrieve, 1926; Sabaroff, 1963-4; Pattison, 1966-7; Rushdoony, 1968; Garnett, 1965; Alen, 1974; Sandford, 1974; Bailey, 1974; Bentley et al., 1975; Arnheim, 1976). From their earliest encounters with maps children are exploring these map elements to a greater or lesser extent, though sadly often in practice little overt attention seems to have been paid to fostering this learning by teachers (D.E.S., 1978). Yet the evidence of research (Stringer, 1976) suggests that experience both of drawing their own and of using prepared maps will enhance the development of children's map understanding.

In order to organize such experience, it is essential that account be taken of the expectations held of children's map learning. Figure 2 presents an outline formulation of these expectations in terms of map drawing and map reading skills and ideas, structured around the elements of the map. The rationale for these criteria for achieve map understanding is that they enable both the setting of objectives for mapwork and offer a structure with which to assess research into the development of children's map ability. Indeed, if objectives for mapwork are to be outlined these must take account of the development of children's understanding.

THE DEVELOPMENT OF MAP ABILITY

In an earlier paper research into children's map ability was reviewed (Catling, 1979a). A central conclusion was that children's understanding of the concept map evolved as they matured. The review suggested that this ontological development is both complex and gradual, and that it is related to the development of children's spatial cognition.

Children's spatial understanding evolves through four stages. The initial stage, during the first few months of life, is that of sensori-motor spatial action, throughout which the child develops a growing awareness of the environment around her. The physical and perceptual encounters with the environment which the infant experiences during this stage, as a result of being moved around and later of moving herself around, provide a stream of momentary and haphazard experiences which lay the foundation for the development of the second stage. When the child develops the capacity to represent mentally to herself an image of even a few features and their relative location, she has entered the stage of egocentric spatial

Figure 2. EXPECTATIONS OF MAP ABILITY

ASPECT	KEY IDEAS	MAP READING SKILLS AND IDEAS	MAP DRAWING SKILLS AND IDEAS
Location & Orientation	a) Understand that a map shows the position of features, and how they stand in relation to each other. b) Appreciate that the map has a frame of reference for indicating position and direction. c) Understand that though north is generally at the 'top' of a map, it may not be.	a) Be able to give or find the position of a feature relative to another. b) Be able to use a grid co-ordinate system (of whichever sort) to find or state position. c) Remember to check the direction indicator of the map. d) Be able to follow or give relative or cardinal directions on a map. e) Be able to place a map so that it is orientated to features or cardinal directions in the environment. f) Be able to locate and indicate the direction of features in the environment from the map.	a) Be able to draw places on a map in accurate relative location to each other. b) Be able to draw a map with features in their correct location, as in a scale plan. c) Remember to include in a map an indication of direction, either of cardinal directions or of relative directions, such as of a nearby town.
Scale	a) Understand the meaning of scale: a proportional reduction of reality. b) Appreciate that maps may be of different scales. c) Appreciate that as scale reduces generalization increases.	a) Know that it is important to check the scale of a map when using it. b) Be able to use the scale on a map for measuring distance and area, also for estimating. c) Be able to compare maps of different scales, both of the same and different areas.	a) Be able to draw a proportionally scaled free-hand map. b) Be able to draw a map to a specific scale. c) Be able to draw maps of different scales of the same area. d) Remember to indicate the scale of the map (or that it is not to scale).
Perspective	a) Appreciate that a map shows perspective from above. b) Understand that a map shows the horizontal space occupied by a feature.	a) Know that large-scale maps show the plan-view form of the environment. b) Know that small-scale maps schematise the 'view from above' of the environment.	a) Be able to draw a map of an area, which shows appreciation of the plan-view perspective involved. b) Be able to show the spatial layout of the area.

ASPECT	KEY IDEAS	MAP READING SKILLS AND IDEAS	MAP DRAWING SKILLS AND IDEAS
Perspective	c) Realize that a map is a two-dimensional representation of a three-dimensional environment, and that many features shown have three-dimensions in reality. d) Appreciate that the 'view from above' enables the spatial layout and relationships of an area to be shown which cannot be readily indicated in any other way. e) Understand that the bounded nature of the map document means that there are relationships beyond it that cannot be shown.	c) Be able to identify features from the 'plan-view' position. d) Be able to perceive symbols where they may overlay or be overlain: to extract 'figure' from 'ground'. e) Be able to interpret altitude, where appropriate, from the map information. f) Be able to identify the spatial characteristics of an area from the map.	c) Be able to draw a large-scale plan-form map of an area or feature. d) Be able to draw a schematic map of an area, indicating specific characteristics.
Symbols	a) Realise that symbols on a map represent features, relationships or generalizations, in the environment. b) Be aware that symbols show location. c) Appreciate that symbols are classificatory: indicating and representing common properties of a class of features. d) Appreciate that as map scale is reduced symbols become more abstract and stylized. e) Appreciate the difference between plan-style 'replicative' symbols of large-scale maps (showing shape, area and exact location) and abstract or 'representational' symbols	a) Be able to use a key. b) Be able to perceive the symbols on a map, and to grasp both the concepts and reality behind them. c) Be able to relate symbols, and thus features, to each other. d) Be able to extract symbols where overlain on or by other symbols, and to perceive the feature or relationship portrayed. e) Know meaning of conventional signs.	a) Be able to choose appropriate symbols to represent features, i.e. symbols that have shared meaning. b) Be able to show the relationships of features by juxtaposing or embedding symbols. c) Remember to include a key with a map drawing.

ASPECT	KEY IDEAS	MAP READING SKILLS AND IDEAS	MAP DRAWING SKILLS AND IDEAS
Symbols	of small-scale maps (showing position and general characteristics of features).		
Purpose	a) Appreciate the purpose of the map and the context of its use. b) Realize that a map merely represents a selection of features, relations and generalizations about the environment, and that this derives from the purpose of the map. c) Assess the extent to which the map fulfils the purpose for which it was intended. d) Understand that a map stands for the real world, but is a generalization and simplification of it. e) Appreciate the limitations of the map: in relation to scale, purpose, size of paper, time of draughting, etc. f) Appreciate the map as both a representational and a conceptual model. g) Understand that there are many different styles of map. h) Appreciate that map-style depends on current knowledge, technology and fashion. i) Realize that the style of the map is related to its purpose.	a) Be able to find, read and understand the title. b) Be able to use the map for the purpose for which it was designed. c) Be able to extract or retrieve information from the map via symbols. d) Know when a specific map is or is not appropriate. e) Be able to explain features, relations or generalizations from a specific map. f) Be able to compare maps of different scales or purposes and extract information or explain circumstances from them. g) Know for what purpose different styles of map are used, e.g. architect's plan drawing, world map of Mercator projection, or topological London underground map. h) Know when to employ the relevant map. i) Know how to extract information from the specific map-style. j) Know the limits of any particular map-style.	a) Be able to draw a map that includes the necessary features to fulfil a specific purpose. b) Be able to draw maps of different types of the same area, to show different features or characteristics: i.e. maps having different purposes. c) Be able to include the title with the map. d) Be able to draw maps of different styles, e.g. scaled plan or topological outline. e) Know which style of map to draw for which circumstances or purpose.

understanding, in which her awareness of the spatial structure of the environment is tied to personal actions, and is characterised by a cognition of experience that is centred on her own viewpoint and involvement. During this stage the child will learn to move around the home and to certain places within its immediate vicinity successfully, as and when she wishes. However, when asked, she finds it difficult to describe, either verbally or graphically, the spatial structure of the area of her movements, in more than sequential terms, occur. The continuous experience of familiar environments, which foster, for example, development of the notions of direction and relative location, leads gradually to a more co-ordinated understanding of the spatial layout of the discrete areas she constantly uses. Achievement of this awareness indicates that the child has entered the stage of objective spatial understanding, and appreciates that spatial relations between features exist objectively, that is, without the need to be described only in terms of her experience of them. Yet the quality of her understanding is still limited, for although she is aware of the spatial relations within a variety of familiar clusters of features, she is not able to co-ordinate these discrete parts within an holistic framework. It is only when she is able mentally to 'survey' the whole of a territory, aware of and able to describe its general structure, including reference to her areas of ignorance, that the child has entered the fourth stage of abstract spatial understanding, which, for example, enables her to describe the integrated nature of her familiar environment and to communicate that understanding fully to others (Catling, 1979b).

The range of reported research into map drawing and map reading ability (see Catling, 1979a; Stringer, 1976; Meyer, 1973; Spencer & Darvizeh, 1981; Piché, 1977) has produced evidence that the child's understanding of the elements of the map is initiated as she enters the stage of egocentric spatial understanding, but does not achieve fruition until the stage of abstract spatial understanding. However, understanding in one element may move ahead of such development in another; for example, children seem to be able to comprehend the symbols on a map before they are aware of the idea of proportional relations (Walker, 1978; Charlton, 1975), though they are unlikely to be able to image a landscape from the mesh of symbols on a topographical map prior to understanding fully the nature of scale, since the two, with the other map elements, are inextricably intertwined in such mental imaging from the map. It would appear from studies of older children's map drawing and reading that problems of understanding persist well into adolescence (Satterly, 1963; Salt, 1966; Pearson, 1968; Ilsley, 1969; Blair, 1964; Lawless, 1974; Boardman, 1975-6; Sandford, 1972; Rhys, 1972; Heamon, 1966; Boardman & Towner, 1979, 1980).

An analysis of the research referred to above reveals the evolution of children's understanding presented in figures 3 and 4. The development of map drawing ability (figure 3) is described separately from the development of map reading ability (figure 4), both for clarity of presentation and because map drawing demonstrates a different aspect of map ability from map reading. Whereas the latter requires the child to comprehend the meaning of and demonstrate skills in using a prepared map, the former demands that the child translate her image of an area, or her findings from area study, into a map graphic which can be understood by others. Map drawing involves the child in the act of creating the map. Map reading requires the child either to bring her cognitive map to or to construct her own image from the map, depending on her knowledge of and recognition of the area shwon (Dale, 1971). Through experience of both aspects of mapwork the child learns to appreciate the knowledge and skills involved in map preparation and map cognition, becoming aware of the limitations inherent in both asepects of selection and interpretation (Robinson & Petchenik, 1976). This last sentence, of course, is a statement of intent; it is hoped that the child will come to realize the value, potential and limitations of the map concept, and become competent at employing it in appropriate circumstances as need arises.

Figures 3 and 4 show that it is no simple matter for a child to understand the elements of the map, although the essential capacity for retrieving information from or presenting information through maps, however simply, is present in early childhood. It is obvious from the range of understanding and the nature of its development that to become what might be called map graphicate (Balchin, 1972; Boardman, 1975-6) involves the interrelated mastery of a wide variety of concepts and skills. Figure 5 presents a generalized summary of the child's development, showing the relationship of spatial understanding to environmental cognition (Moore, 1976), drawing ability (Goodnow, 1977; Butterworth, 1977) and the elements of map ability.

A note of caution in interpreting these figures must be appended here. The outline of children's map ability development presented in figures 3, 4 and 5 is schematic and essentially notional. The range of

Figure 3. DEVELOPMENT OF THE CHILD'S MAP DRAWING

ASPECT	EGOCENTRIC SPATIAL UNDERSTANDING	OBJECTIVE SPATIAL UNDERSTANDING	ABSTRACT SPATIAL UNDERSTANDING
Location & Orientation	Poor locational awareness: egocentric frame of reference	Development of object frame of reference.	Abstractly co-ordinated frame of reference used in map drawing.
	Topological connections: connectedness, sequence, order	Projective relations: sequential structuring, partially co-ordinated, some distortion of location and relations though.	Metric structure: geometric pattern, integrated whole.
		Tendency to cluster groups of features distinctly from each other: better structured than links between them.	
	Sequential style of construction: concern with simple relations.	Sequential style, with branching pattern, linking to known areas.	Survey-style, construction: aware of relations of parts of area.
	Map drawing could not be used for navigation in the area it depicts.	Improving accuracy: partial value in orientation in area shown.	Accurate positioning of features: map drawing could be used for orientation in the area.
Scale	No real understanding of scale.	Idea of relative scale developing.	Appreciates concept of scale.
	Features are smaller than reality because of paper.	Difficulty in drawing to scale.	Can draw to scale: includes scale line.
	Size emphasis on 'own' features, e.g. home.	Still tendency to emphasise 'favoured' places. Idea of proportion developing.	Proportional sizes of features roughly accurate.
	Distance unconsidered, just separation.	Some distance relationships being indicated: tendency to over-estimate immediate distance, and under-estimate longer distances.	Proportional distances roughly accurate. Aware of limitation of paper, stops when not room rather than squeeze features onto paper.
		Tendency to squeeze features onto edge of paper, even if known to be further away.	

ASPECT	EGOCENTRIC SPATIAL UNDERSTANDING	OBJECTIVE SPATIAL UNDERSTANDING	ABSTRACT SPATIAL UNDERSTANDING
Perspective	Elevation perspective: unaware of hidden 'dead ground'.	Begins to distinguish 45° and 90° viewpoints: attempts to use understanding, but often produces both on same map.	Plan-view perspective: aware that feature occupies horizontal space, and that map shows all ground.
	Little awareness of map idea: aware of connections, but little idea of how to show them; attempts picture-style as solution.	Becoming aware of map as means of showing relations that cannot be shown in other ways.	Aware of map as showing spatial structure and relationships of environment: uses understanding correctly.
	Situation viewed from own viewpoint: egocentric.	Developing awareness of relationships beyond egocentric connections.	Objective view of space: co-ordinates perspectives. Possible recognition of problem of showing height: developing solutions.
Symbols	Pictorial, individualized drawings of features: little recognition of need for public sharing of meaning.	Recognition of need to share and communicate with symbols. Stylized, iconic symbols: possible use of key.	Aware of symbols as mode of communication and as source of information.
		Idea of similarity developing.	Plan-view representation. Introduction of abstract symbols. Use of standardized symbols. Recognition of need for key.
	Starts to develop equivalents (or representations) to show features.	Modification of conventional (or old) equivalents to represent features and spatial relationships.	Development of new equivalents to represent features and spatial structure.

ASPECT	EGOCENTRIC SPATIAL UNDERSTANDING	OBJECTIVE SPATIAL UNDERSTANDING	ABSTRACT SPATIAL UNDERSTANDING
Purpose	Tendency either to include all that is known regardless of value, or to be arbitrary or sparing in content to point of little value.	Attempts to provide necessary information in map, but problem of uncertainty about content: inclined to be unselective of whole content.	Able to decide what should and should not be included and how it is best shown: produces useful map that suits purpose intended.
Map Drawing	Production of a pictorial drawing of an area.	Production of a schematic drawing of an area.	Production of a map-style drawing of an area.
	No use of paper as framework for map.	Use, initially without differentiating, of paper edges as framework for map.	Constructs own borders for map.
	Tendency to use parts of paper only: large empty spaces.	Tendency to cover paper, but spaces unconnected with content.	All of paper used in a rational way: spaces have meaning.
	Features excluded if placement impeded by others already drawn.	Distortion of placement of features occurs as means of solving problem of impediment of previously drawn features.	Idea of embeddedness of symbols develops: overlaps or overlays symbols where necessary.
	Tendency to employ an orthographic projection in drawings.	Recognition of problem of representing 3-dimensional environment in two dimensions: attempts at solution.	Solution of problem of two-dimensional representation of three-dimensional environmental space.
		Attempt to introduce depth: oblique projection (yet does not display what is known).	Co-ordination of spatial relations successful, and use of perspective in plan-view drawings.

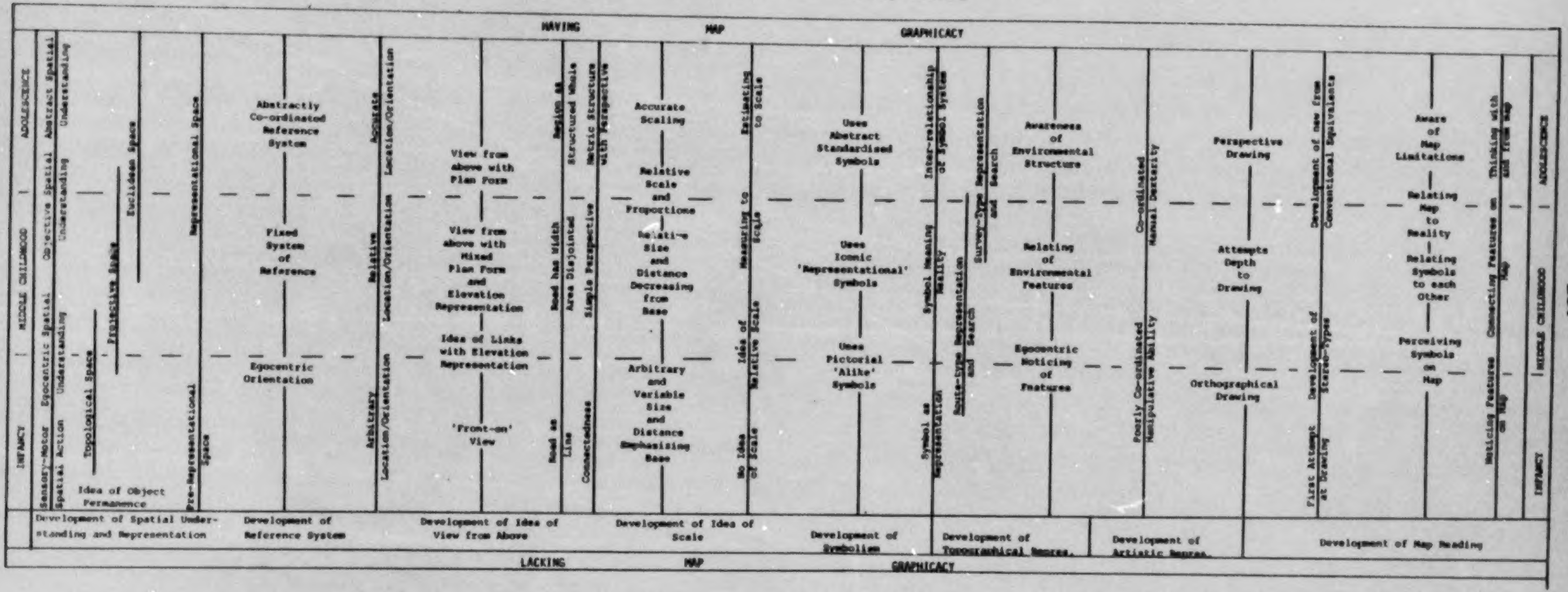
ASPECT	EGOCENTRIC SPATIAL UNDERSTANDING	OBJECTIVE SPATIAL UNDERSTANDING	ABSTRACT SPATIAL UNDERSTANDING
		Uncertain of map scale related to to real world.	Able to relate map scale to real world. Knows to check scale of map before assessing distance, size, etc.
Perspective	Difficulty in appreciating map perspective, but can identify a few specific features from new viewpoint.	Developing appreciation of plan-view perspective - understanding of perspective over a small area, e.g. map of neighbourhood.	Understands plan-view perspective of map. Appreciates perspective over a region: large area.
		Aware that buildings have height, but difficulty in understanding map has depth: how it represents a 3-D environment in two dimensions.	Can appreciate depth in map, and shape of landscape.
Symbols	Can identify symbols if stylized and obvious, not really in need of a key.	Can appreciate plan-form symbols. Appreciates more generalized symbols - becomes aware of need for a key.	Appreciates symbols as generalizations and classifications. Understands value of key, and uses it.
		Growing awareness that symbols stand for features: begins to be able to image individual features.	Can interpret abstract symbols, and relate meaning to real world situation. Aware that symbols can show relationships.
		Can relate small number of symbols to each other. Can appreciate relief representation (better understanding of layer shading than contour lines).	Can understand complex pattern of symbols - can extract embedded shapes. Can interpret relief symbols.
		Begins to relate map of familiar area to personal image of that area.	Begins to construct image of unfamiliar area from map of it.

ABSTRACT	EGOCENTRIC SPATIAL UNDERSTANDING	OBJECTIVE SPATIAL UNDERSTANDING	ABSTRACT SPATIAL UNDERSTANDING
Purpose	Fails to appreciate purpose of a particular map.	Can use map for a specific purpose.	Able to understand and use map for purpose intended.
	Unable to select appropriate map.	Uncertain as to appropriateness of specific map when needs to make choice.	Aware of limitations of different types of maps. Can select appropriate map for specific purpose.
Map Reading & Interpretation	Able to comment on a simple relationship, e.g. this is my house, that is yours, and this road joins them, etc.	Able to derive information from map, e.g. this route is the one to follow from A to B, X farm is in square L9, etc.	Able to extract variety of alternatives from map, e.g. these are the routes that could be used, but this is the shortest, etc.
	Looks haphazardly around the map: interested in features (symbols) that catch his eye.	Inclined to take trips across and round the map, possibly linked up: still tends to be more interested in detail.	Able to survey map as a whole: picks out general characteristics of area.
		Attempts to identify patterns but has problem in explaining them, e.g. X is a settlement because it has a name.	Can identify relationships on a map and draw conclusions from them, providing explanations, e.g. X is a settlement because a) relation of buildings and b) number of buildings, etc.
		Able to offer simple reasons and explanations from map, e.g. cannot go across there because houses are in the way.	Able to offer complex explanations from the map, e.g. the shorter route may take longer to travel than this lengthier route because the former is over difficult terrain which the latter avoids.
		Attempts to relate simple additional information to the map, but has difficulty in drawing valid conclusions from both: explanations tend to lack logic.	Can relate other information to the map: draws on own experience, uses verbal, numeric or graphic information - to draw conclusions and provide reasons. Can derive explanations by and from comparison of maps.

Figure 4. DEVELOPMENT OF THE CHILD'S MAP READING

ASPECT	EGOCENTRIC SPATIAL UNDERSTANDING	OBJECTIVE SPATIAL UNDERSTANDING	ABSTRACT SPATIAL UNDERSTANDING
Location & Orientation	Understands relative location and orientation: i.e. near to, left of, etc. - but has problems of left-right confusion.	Can use simple grid systems, e.g. B6, developing to simple number grids, e.g. 4925	Can use a complex grid, i.e. 6 figure reference. Develops understanding of longitude and latitude grid system.
		Can use cardinal directions, i.e. N., S., etc. developing to NW., SE., etc.	Can understand and use all compass directions.
	Difficulty in following pre-determined route on map, but able to show a route on a map.	Learns to give and follow directions over routes and sections of a map, and do same with map in both familiar and unfamiliar environment.	Can describe and follow way around a map. Can advise on likely features to be encountered in unfamiliar area from the map, in the field.
	Difficulty in aligning map to environment.	Develops capacity to align map using compass directions, but continuing problems of confusing east-west relations (may be linked to left-right confusion).	Appreciates that cardinal directions are absolute - able to align map using all compass directions correctly.
	Able to relate specific symbols on map to particular features in environment and vice versa.	Learns to relate map features to landscape features, and can align map using landscape features.	
Scale	No idea of formal scale.	Develops ability to use a simple scale line to measure distance.	Understanding of scale: measuring and estimating, distance and area.
	Some idea of proportion, e.g. this building is bigger than that, this road is longer.	Developing appreciation of proportion, e.g. snaking road longer than straight road. Appreciates relative size. Not sure of ratio or relationship of different scales.	Can compare different scales. Appreciates ratio. Can compare sizes.

Figure 5. ELEMENTS IN THE DEVELOPMENT OF MAP ABILITY (after Moore, 1978)


HAVING MAP GRAPHICACY
INFANCY
MIDDLE CHILDHOOD
ADOLESCENCE
Sensory-Motor Spatial Action
Egocentric Spatial Understanding
Objective Spatial Understanding
Abstract Spatial Understanding
Idea of Object Permanence
Topological Space
Projective Space
Euclidean Space
Pre-Representational Space
Representational Space
Egocentric Orientation
Fixed System of Reference
Abstractly Co-ordinated Reference System
Arbitrary Location/Orientation
Relative Location/Orientation
Accurate Location/Orientation
'Front-on' View
Idea of Links with Elevation Representation
View from above with Mixed Plan Form and Elevation Representation
View from above with Plan Form
Road as Line
Road has Width
Region as Structured Whole
Area Disjointed
Connectedness
Simple Perspective
Metric Structure with Perspective
Arbitrary and Variable Size and Distance Emphasising Base
Relative Size and Distance Decreasing from Base
Relative Scale and Proportions
Accurate Scaling
No Idea of Scale
Idea of Relative Scale
Measuring to Scale
Estimating to Scale
Uses Pictorial 'Alike' Symbols
Uses Iconic 'Representational' Symbols
Uses Abstract Standardised Symbols
Symbol as Representation
Symbol Meaning Reality
Inter-relationship of Symbol System
Route-type Representation and Search
Survey-type Representation and Search
Egocentric Noticing of Features
Relating of Environmental Features
Awareness of Environmental Structure
Poorly Co-ordinated Manipulative Ability
Co-ordinated Manual Dexterity
Orthographical Drawing
Attempts Depth to Drawing
Perspective Drawing
First Attempt at Drawing
Development of Stereo-Types
Development of new from Conventional Equivalents
Perceiving Symbols on Map
Relating Symbols to each Other
Relating Map to Reality
Aware of Map Limitations
Noticing Features on Map
Connecting Features on Map
Thinking with and from Map
INFANCY
MIDDLE CHILDHOOD
ADOLESCENCE
Development of Spatial Understanding and Representation
Development of Reference System
Development of Idea of View from Above
Development of Idea of Scale
Development of Symbolism
Development of Topographical Repres.
Development of Artistic Repres.
Development of Map Reading
LACKING MAP GRAPHICACY

BEST COPY AVAILABLE

research from which it has been constructed is varied in depth, breadth and quality. Though much work has been undertaken in the U.K., the U.S.A., Australia and elsewhere (see: Satterly, 1963; Rushdooney, 1968; Stringer, 1976; Catling, 1979b; Wilson, Gerber & Fien, 1981), it has generally been small scale: limited in sample total and cross-section, in the age-range covered, and in the nature and variety of map elements, styles and situations. Inevitably there is the danger of generalization from limited findings. This occurs in the research; and the structure outlined in figures 3, 4 and 5 cannot be excluded from such a charge. There must, therefore, be care taken in reading too much into the findings which have been synthesized into the developmental sequences of children's map drawing and map reading ability.

CONCLUSION

This review has presented not so much an overview of the research evidence as an attempt to develop from a wide range of studies a coherent outline of the development of children's map ability, drawing together research into map drawing and map reading. It is offered as a tentative step towards the construction of a theory that may help to explain the development of children's map ability. That such a synthesis of disparate evidence has limitations has been noted. Yet this growing evidence, though piecemeal, has continually provided deeper insights into the nature and development of children's map ability. It seems pertinent that what it has to offer should be built upon rather than discarded. Thus, the outline of development presented in figures 3, 4 and 5 should focus our thinking on the conclusions of the research to date. Though it attempts an explanation of the evidence, it might equally act as a guide to future studies. Considerable gains would accrue from broadly based and detailed studies which fill in the gaps, and challenge, modify or back up this postulated structure. Equally, what is proffered may have value for our teaching, if it enables us to organize the experiences which are important in the development of children's map ability in sequences which both use and maximize their level of awareness and potential for understanding. Achieving this must be our goal.

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PUBLISHED GUIDANCE TO PUPILS ON ATLAS MAPWORK SKILLS

Herbert A. Sandford *

Abstract Most school atlases provide the pupil with some guidance in skills for their use. This may be organised into a distinct introductory section, or may permeate through and influence the entire compilation, and it may be complemented by a separate workbook or handbook. The nature, extent and content of this guidance is examined, and some possible inadequacies are revealed.

TYPOLOGY AND RELATIONS OF DESK ATLASES AND ASSOCIATED WORKBOOKS AND HANDBOOKS

The guidance provided directly to pupils for their development of desk atlas skills needs to be considered in its full and rather complex context (Figure 1). Of atlases marketed for children, both those sold through retail outlets for domestic use and those sold for institutional scholastic use, may contain some guidance. It may be limited to a partial key to the symbols, and usually is in the cases of retail (trade) atlases and of history and bible atlases, though there are some striking exceptions such as Osborne's Children's Atlas in its current edition (Pask 1979). The present concern is with predominately geographical atlases, whether local, national or global in scope (eg. the Westermann Grundschulatlas Hessen, List's Regionalatlas Bundesrepublik Deutschland and Klett's Alexander Weltatlas respectively), and, among these, with the desk atlas (working atlas or class atlas) rather than with the reference atlas that is shelved out of the way.

Existing classifications cannot be meaningfully applied to desk atlases and associated publications. Saliscev treats of 'school atlases' as a whole in his main typology (Saliscev 1967) but Imhof in his breaks them down into history and geography atlases, and into regional and world atlases (Imhof 1972). A more helpful typology is that of Curkin who adds the concept of 'zweck' or purpose and thus recognise Grund -, Mittel -, and Hochschulatlas (Curkin 1961, 1974). Stams, after an excellent summary of the above and other classifications, puts forward his own

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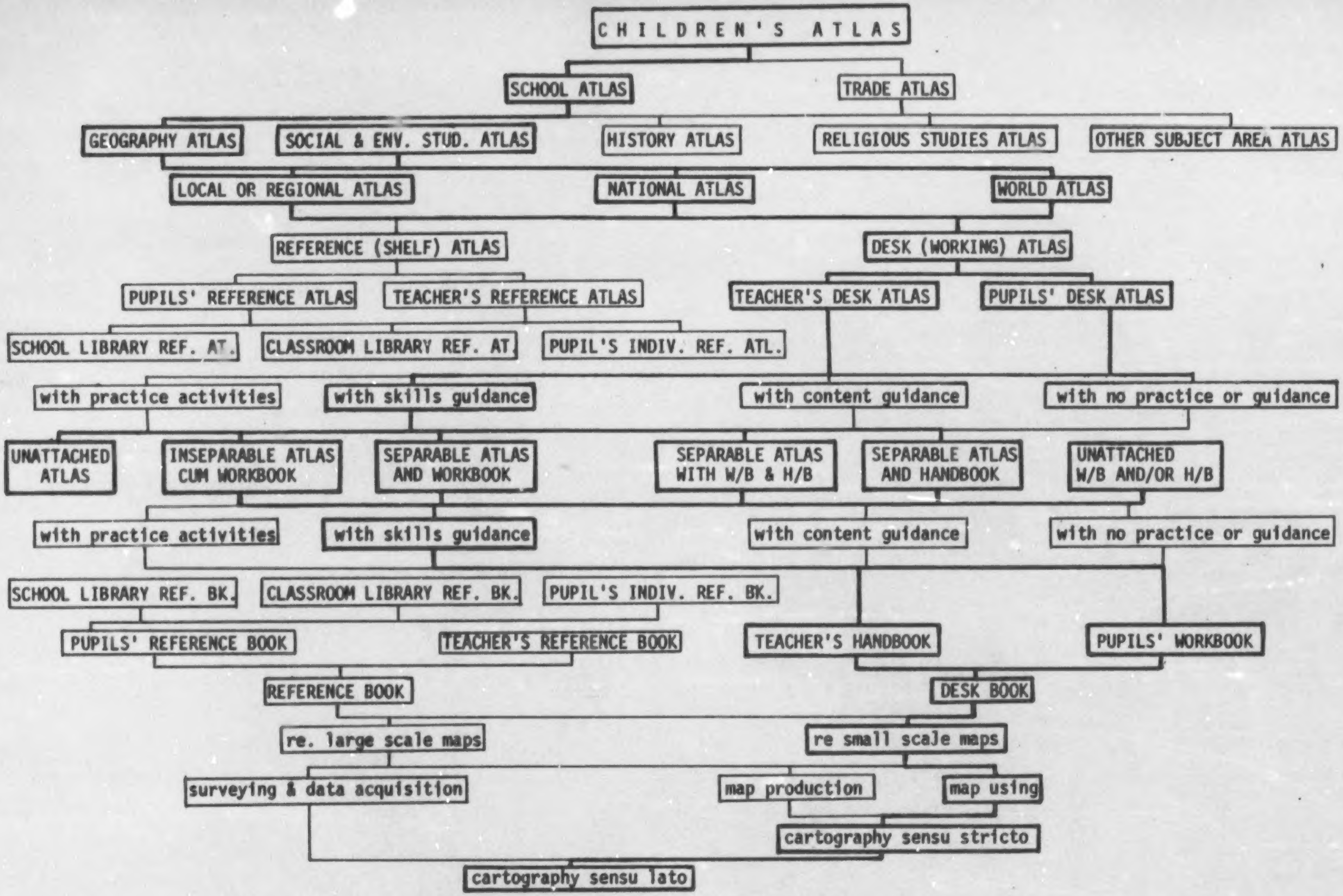
CHILDREN'S ATLAS
SCHOOL ATLAS
TRADE ATLAS
GEOGRAPHY ATLAS
SOCIAL & ENV. STUD. ATLAS
HISTORY ATLAS
RELIGIOUS STUDIES ATLAS
OTHER SUBJECT AREA ATLAS
LOCAL OR REGIONAL ATLAS
NATIONAL ATLAS
WORLD ATLAS
REFERENCE (SHELF) ATLAS
DESK (WORKING) ATLAS
PUPILS' REFERENCE ATLAS
TEACHER'S REFERENCE ATLAS
TEACHER'S DESK ATLAS
PUPILS' DESK ATLAS
SCHOOL LIBRARY REF. AT.
CLASSROOM LIBRARY REF. AT.
PUPIL'S INDIV. REF. ATL.
with practice activities
with skills guidance
with content guidance
with no practice or guidance
UNATTACHED ATLAS
INSEPARABLE ATLAS CUM WORKBOOK
SEPARABLE ATLAS AND WORKBOOK
SEPARABLE ATLAS WITH W/B & H/B
SEPARABLE ATLAS AND HANDBOOK
UNATTACHED W/B AND/OR H/B
with practice activities
with skills guidance
with content guidance
with no practice or guidance
SCHOOL LIBRARY REF. BK.
CLASSROOM LIBRARY REF. BK.
PUPIL'S INDIV. REF. BK.
PUPILS' REFERENCE BOOK
TEACHER'S REFERENCE BOOK
TEACHER'S HANDBOOK
PUPILS' WORKBOOK
REFERENCE BOOK
DESK BOOK
re. large scale maps
re small scale maps
surveying & data acquisition
map production
map using
cartography sensu stricto
cartography sensu lato

Figure 1. TYPOLOGY OF SCHOOL ATLASES AND ASSOCIATED PUBLICATIONS.
(The heavy lines indicate the main focus of interest of the accompanying text. Each box or cell may be subdivided according to educational grade or level, and according to the language in which it is couched.)

expanded typology (Stams 1975). Unfortunately, even this does not include guidance as a distinguishing characteristic. Dubut did, but in her important and detailed analysis of 150 pupils' desk atlases she found substantial guidance in too few for it to form a diagnostic feature in her typology, not even for her category of '*atlas d'initiation*' or 'first atlas' (Dubut 1982).

The proposed classification (Figure 1) not only innovates shelf and desk atlases, and teacher's and pupils' atlases, but also divides these last according to the nature of the guidance rather than school grade. For present purposes, grade may be considered as an extra dimension affecting the whole of the classification, which therefore may be read successively at, any, primary, middle and upper school levels, so that there are lower, middle and upper school atlases. Similarly for pupils' mapwork books, and for all other 'cells' in the diagram. A further all-through subdivision would be in respect of the language of the publication, which has relevance to the rendering of geographical names in particular.

It is important to distinguish between practice and guidance, and between guidance for skills and that for content (Figure 2). When an atlas provides an explanation of latitude and longitude, perhaps with a worked example or even a single confirming exercise, it is mapwork *guidance*. A few atlases however, notably the once famous *Study Atlas* by Workman out of Collins-Longman, set out extensive exercises for the pupils. Such activity is mapwork *practice*. Guidance may develop the *skills* with which to manipulate symbols, scales, co-ordinates and the like, or else may describe, explain and amplify the graphic *content* of the atlas. Pupils' atlas workbooks and teachers' atlas handbooks are both kinds of desk book, but while the former *directly* guide the pupils, the guidance in the latter is mediated through the teacher. Figure 1 shows that not all desk books relate to specific atlases any more than do all atlases have a companion desk book, and that some pupils' workbooks and teacher's handbooks are of no use without the atlas for which they have been prepared (even though it is possible for these atlases to be used separately).

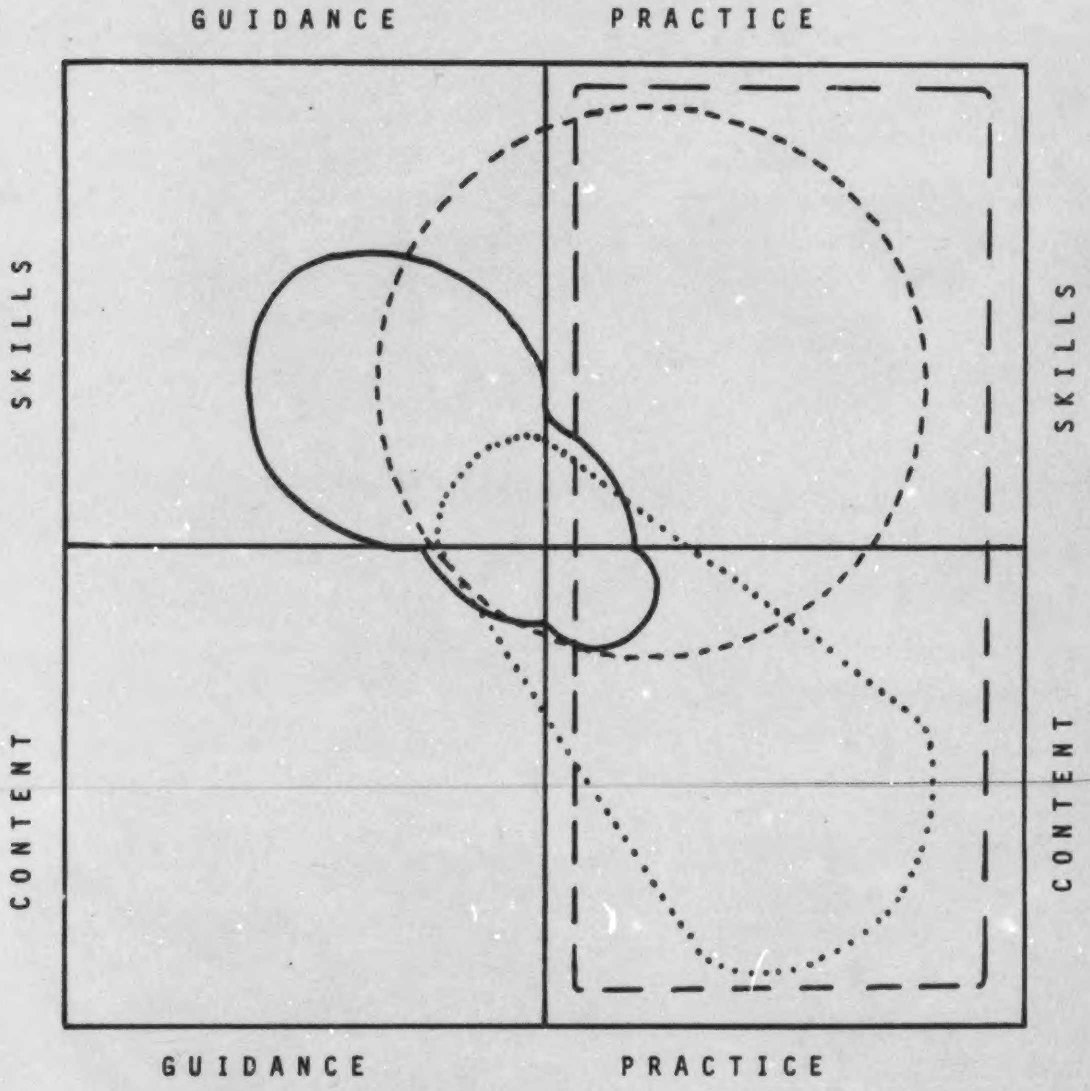
GUIDANCE
PRACTICE
SKILLS
SKILLS
CONTENT
CONTENT
GUIDANCE
PRACTICE

Figure 2. ANALYSIS OF ATLAS-RELATED MATERIAL IN MODAL EXAMPLES OF FOUR ATLAS-RELATED MEDIA.

——— pupils' desk atlas
— — pupils' free search
- - - pupils' workbook
······· teacher's handbook

It is helpful and necessary to consider the relationship between large scale (topographic or cadastral) mapwork and small scale (chorographic or atlas) mapwork, and between (surveying and) drawing maps and using them (Figure 3). Atlas mapwork guidance has come to involve a prolonged preface of largescale mapwork guidance by way of sketch perception maps, official topographic survey maps, and others. It seems legitimate to count this largescale guidance in with atlas guidance per se whenever it occurs in such a context. In the present enquiry the emphasis is upon map using (reading and interpretation) rather than on map making (drawing and even surveying) though cognizance is taken of the latter when invoked to aid comprehension and use of atlas maps. Figures 2 and 3 do not show the complementary and supportive provision of guidance and practice to serve educational and private interests that might have been expected. The reasons for this are obscure.

THE DEFICIENCY IN ATLAS MAPWORK GUIDANCE

Despite the wide range of published works containing guidance for atlas use there is in toto far less than for large scale maps. This last is profuse. In her sample of 150 scholastic atlases, Dubut found only ten examples of 'livres du maitre' (teacher's handbooks or manuals) and only 15 examples of 'livrets on pages de travaux pra tiques' (pupils' workbooks or atlases-contained pages of guidance and/or activities). Sandford's contemporaneous survey of over 300 similar atlases, though analysed differently, arrives at essentially the same conclusion (Sandford 1982).

The relative sparcity of atlas mapwork guidance belies the importance widely attached to it. Indeed, in many parts of the world more teaching effort is devoted to small than to large scale maps, especially where official survey sheets are not generally available as in Nigeria and in the Communist Bloc. Relevant Basic Skills figure in the appropriate Iowa Test (Section W, map reading), and many UK Certificate of Secondary Education Examinations have questions, even compulsory ones, involving the practical use of atlases in the examination room. The University of London has gone further and now publishes a special 'examination atlas' for use by candidates en courrant and made up out of pages

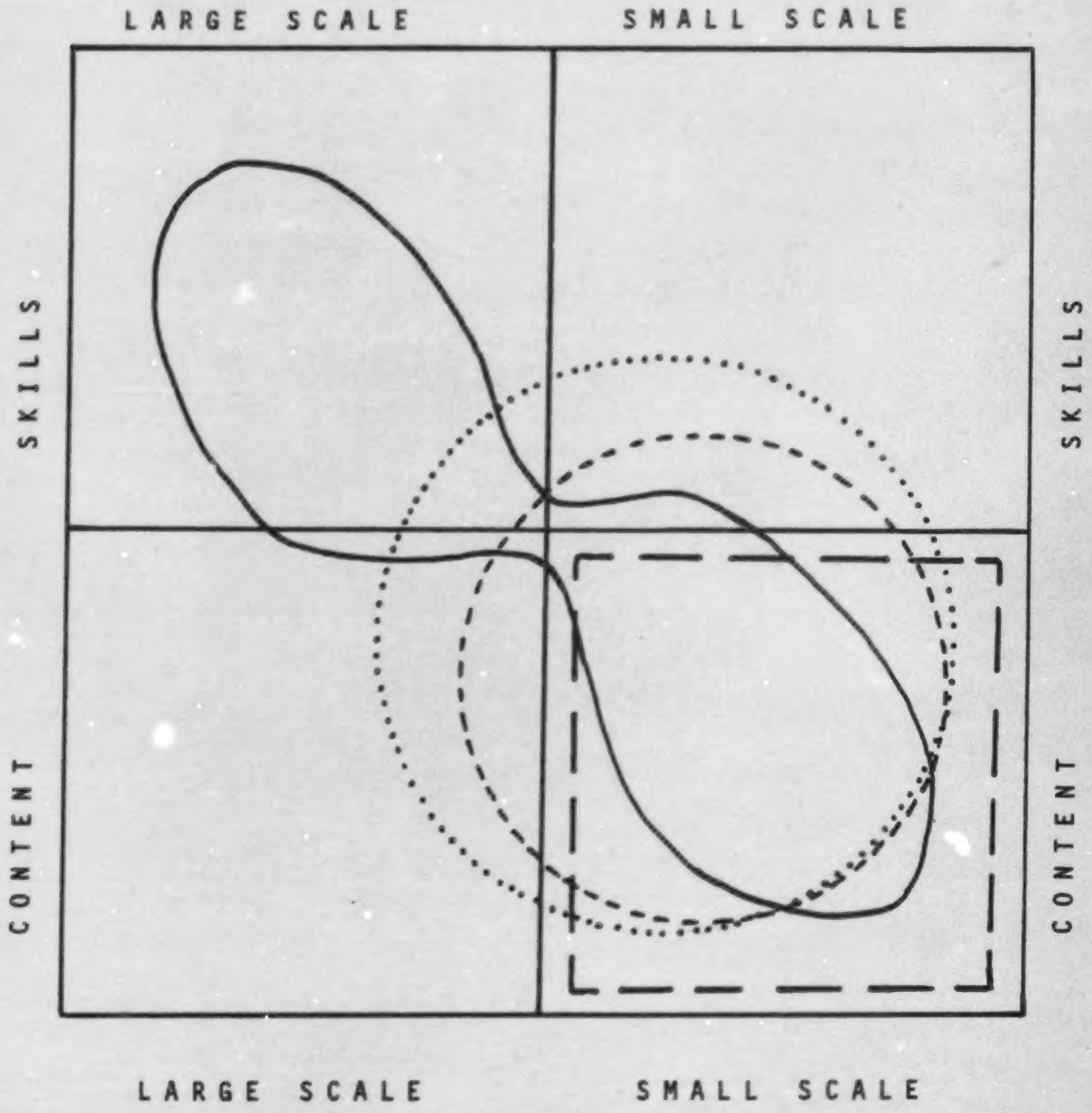
LARGE SCALE
SMALL SCALE
SKILLS
SKILLS
CONTENT
CONTENT
LARGE SCALE
SMALL SCALE

Figure 3. USE AND SCALE RELATIONS IN ATLAS-RELATED MATERIAL IN MODAL EXAMPLES OF FOUR ATLAS-RELATED MEDIA.

——— pupils' desk atlas
— — pupils' free search
- - - - pupils' workbook
.... teacher's handbook

selected from Bartholomew's range of 'environmental atlases' (Sandford 1980d); and another similar examinations board is to follow suit. But examiners' reports often express dismay at the low level of candidates' attainment in atlas mapwork. This is not a mere artifact of item analysis and the application of facility indices during the preparation of the question papers. It is real. The present writer studied the atlas mapwork of 1600 English secondary school children and concluded that their low level of attainment is not due to low innate ability but to atlas skills being taken for granted in most teacher training, and, therefore, by most trained teachers (Sandford 1970).

A volunteer group of eleven newly qualified secondary school geography teachers in England was questioned about a conventional, general-purpose, hypsometrically-coloured, pupils' desk atlas map of China. Not one could give the height of the surface of Lake Baykal as being between 400 and 800, the lower and upper limits of the altitude colour surrounding the lake, and only five of the attempts offered an answer in metres, though it was a metric map! The position appears to be much the same in America, for example, where Schneider found similar results among elementary school teachers, more than half of whom could not identify lines of latitude and longitude (Schneider 1976)!

There seems to be a fairly wide assumption that if a child can handle the large scale map he needs no specific atlas guidance. In a survey of geography teaching in 21 European countries, mapwork figures very prominently, and atlases were found to be widely distributed, but atlas mapwork as such was declared to be significant by only Malta (Marchant 1971). It is little more than an afterthought in The Use of Maps in Schools (Bentley e.a. 1975) and gains only nine lines in the Schools Council's Understanding Maps (Schools Council 1979). Such neglect is not confined to Europe. In Nigeria for instance no reference is made to atlas mapwork skills in the syllabus prepared for schools by the Institute of Education of Ahmadu Bello University, Zaria, and to be used by the present writer in the compilation of Evans Junior Atlas Junior Atlas for Social Studies (Sandford 1980a).

There is a very real gap that has to be bridged between large and small scale mapwork, a gap which could be partly filled by the all-too-little used International One-in-a-Million map sheets. By virtue of its scale, and of the unfamiliarity and remoteness of what it depicts, the atlas is necessarily more abstract, more divorced from reality. The round globe/flat map problem is a severe test of a girl or boy's conceptual powers, quite apart from the sheer practical difficulty of page turning (over and round) and the strain on short term memory imposed by the impossibility of placing atlas maps of adjacent areas side by side as one can topographic map sheets.

The present wide currency of satellite imagery undoubtedly helps today's youngsters to understand the small scale atlas map. But this understanding is best mediated through a globe. The globe is now less used in schools and some children get no nearer to one than the globe pencil sharpener, or the more recent Magic Globe that is constructed internally and manipulable in the manner of Rubik's Cube (Sandford 1982b). The influence of the former has been ably written up by Sperling (Sperling 1978).

THE ORIGINS OF NEGLECT

In the teaching of geography in nineteenth century England, reference atlas and demonstration globe were of great importance (and wall maps too, in the board schools) and children were tutored and schooled in their use. Not only would they learn to find the antipodes of any place, but also its perioeci (those living in the same latitude but in opposite semi-circles of the same meridian) and its antoeci (those living in the same semi-circle of the meridian but in opposite parallels of latitude)! The pupil of that generation could solve problems with atlas or globe which the teacher today cannot even formulate!

When Scott Keltie toured Europe for the Royal Geographical Society, and brought back to England the ideas of heimatskunde (home knowledge; local geography) and anschauungslehre (learning by observation; fieldwork), there came an enthusiasm for the Ordnance Survey map, for the finely engraved, black-and-white, one inch topographic map in sheet form. Numerous articles appeared in The Geographical Teacher, later Geography, and in successive Geographical Association handbooks, to guide teachers in their use in the classroom. This was established the focus of interest on the largescale topographic map sheet that persists to this day.

Under pressure from full timetables, more time spent on Ordnance Survey maps meant less time for atlases. When cheap pupils' desk atlases came, the demonstration globe fell into disuse and teachers began to forget the value of the latter for an understanding of the former. Cheap pupils' desk globes came much later. Their proper use was pioneered in the famous William Ellis School in London, but unfortunately they never widely 'caught on'.

English pedagogic preferences for mapwork became widely disseminated outside Europe, but the relative neglect of the atlas has perhaps been less marked on the mainland (Sandford & Jacobs 1981) where there has been a greater interest from an early date (Peucker 1893).

Syllabuses reflect externally prescribed desiderata involving citizenship, jobs, the needs of higher education and so forth, while the great majority of pupils, on leaving school, have quite a different and more casual approach to the atlas and to other small scale maps. In England, for instance, atlases are found in the majority of homes, and both parents and their children browse through them from time to time for interest and pleasure.

ANALYSIS OF PUPILS' ATLAS MAPWORK BY FREE AND DIRECT SEARCH

Royle studied the voluntary or free search of pupils' desk atlas maps by 35 primary school children in England (Royle 1975), and Sandford similarly by 340 secondary school children (Sandford 1966 (1967)), through an analysis of their running commentaries.

Some of the more significant details are tabulated in Figures 4,5, and 6. Figure 4 classifies the children's interpretational skills by theme. These themes are usually single phenomena studied over a large area (less 'g' than 'x' according to Hartshorne 1939, 1959), as in international airway networks), but may synthesise a number of phenomena in a more restricted area (less 'x' than 'g' as in a classic French study of a pays). The alternative to free search is direct search during which children have to involve themselves in activities set by the teacher, and the Figure details this as given in the unattached pupils' atlas workbooks

INTERPRETATIONAL THEME	INTERPRETATIONAL SKILLS					
	FREQUENCY				SUCCESS	
	FREE SEARCH		DIRECTED SEARCH		FREE S.	DIRECTED S.
	Royle 1975 (%)	Sandford 1967 (%)	Moore 1973 (%)	Prater 1975 (%)	Sandford 1967 (%)	Sandford 1970 (%)
Structure	12	10	0	0	99.3	39.1
Relief		28	0	0	96.2	
Drainage		7	0	0	71.8	
Climate	24	22	0	100	79.0	38.8
Vegetation		2	0	0	53.8	
Occupations	64	9	0	0	68.0	44.5
Settlements		9	0	0	65.4	
Communications		4	0	0	94.8	
Other		9	0	0	80.6	
TOTAL	100	100	0	100		

Figure 4. ANALYSIS OF PUPILS' ATLAS MAPWORK PRACTICE BY FREE AND DIRECT SEARCH: INTERPRETATIONAL SKILLS.

	OBJECTIVAL SKILLS					
	FREQUENCY				SUCCESS	
	FREE SEARCH		DIRECTED SEARCH		FREE S.	DIRECTED S.
OBJECTIVES	Royle 1975 (%)	Sandford 1966 (%)	Moore 1973 (%)	Prater 1975 (%)	Sandford 1966 % 1967	Sandford 1970 (%)
Using symbols	43	24	14	13	98.1	26.2
Locating places	27	35	85	76	98.9	99.7*
Finding routes	t	t	1	5	99.6	37.0
Observing distributions	10	13	0	0	97.2	39.0
Making comparisons	17	19	0	5	99.9	60.6
Achieving partial overviews	2	8	0	1	99.4	38.5
Achieving total overviews	t	t	0	0	99.9	60.1
TOTAL	100	100	100	100		

Figure 5. ANALYSIS OF PUPILS' ATLAS MAPWORK PRACTICE BY FREE AND DIRECT SEARCH : OBJECTIVAL SKILLS

* Pupils were provided with a locational overlay t = trace

MANIPULATIONS OF SYMBOLS	FUNDAMENTAL SKILLS									
	ALL FUNDAMENTAL SKILLS						HIGHER ORDER FUNDAMENTAL SKILLS			
	FREQUENCY				SUCCESS		FREQUENCY			
	FREE SEARCH		DIRECTED SEARCH		FREE S.	DIRECTED S.	FREE SEARCH		DIRECTED S.	
	Royle 1975 %	Sandford 1966 % (1967)	Moore 1973 %	Prater 1975 %	Sandford 1966 % (1967)	Sandford 1970 %	Royle 1975 %	Sandford 1966 % (1967)	Moore 1973 %	Prate 1975%
Map Reading										
Perception	37	38	34	34	98.1	68.9	0	0	1	0
Apperception	37	38	34	34		44.2	54	46	6	13
Qualitative techniques	16	15	31	30	99.0	77.4	20	31	90	82
Quantitative techns.	4	6	1	1	95.6	76.2	12	18	3	2
Map Interpreting										
Qualitative interp'n.	6	2	0	1	98.5	53.4	14	5	0	3
Quantitative interp'n	0	0	0	0			0	0	0	0
TOTAL	100	100	100	100			100	100	100	100

Figure 6. ANALYSIS OF PUPILS' ATLAS MAPWORK PRACTICE BY FREE AND DIRECT SEARCH : FUNDAMENTAL SKILLS OF MANIPULATING SYMBOLS

by Moore (1973) and Prater (1975). These are typical of the genre and a useful source of information on what teachers want children to be able to do with atlases. It is seen in the Figure that only very rarely are these high level interpretational skills required by teachers although children are interested in making them and are quite successful, especially when choosing their own.

In order to discuss these topics the child has first to reach intermediate objectives, to employ such objectival skills as to use map symbols, locate places, find routes, observe distributions, make comparisons and achieve partial or more general overviews of the map (Figure 5). These objectives are listed in order of increasing apparent difficulty, though this appearance is not confirmed by the success rates also given in the Figure. It is notable that these authors were overwhelmingly interested in the pupils' ability to locate places (shades of the old, discredited, 'capes-and-bays' geography?).

Figure 6 analyses the same data in terms of initial, fundamental skills employed,their classification having arisen naturally from the study of the children's own commentaries. Simple map reading is related directly to what the map symbolises and involves seeing and understanding these symbols (perception and apperception), and then manipulating them in either a literary or else in a numerical manner (qualitative and quantative techniques). For instance, a child might say that "The Indus is a big river" or that "The Indus is nearly 3000km long". In Sandford's study there were enough techniques employed for meaningful subdivision. Qualitative techniques were distributed as numerosity (numerousness) 12%, area 13, shape 2 density 1, height and depth 33, 'being part of' 3, 'forming a group of' 3, length 4, direction 4 and position 26: qualitative techniques as horizontal scale 4%, vertical scale 44, compass 44, co-ordinates 8 and projection, a trace (one example only). In directed search there is such variation between authors that it might be better to quote the same average figures that are already available: Workman (1939), Wright (1942), Midgley (1950) and Moore in his first edition (1961) Sandford 1966 (1967). (In view of these early publication dates it needs to be stated that there has been little progress made in this type of publication since then). They give qualitative techniques of area 10%, 'group' 8, length 4, direction 4 and position 70: quantitative techniques of horizontal scale 27, vertical scale 6, compass 39 and co-ordinates 28.

Skills of map interpretation are of higher order than those of map reading, for they involve deduction ("The Indus floods") and induction ("The longest rivers in India rise in the Himalayas") from the directly mapped evidence (Sandford 1972). Interpretation may also be either in words or in numbers, qualitative or quantitative: the railway network in Russia may be described as being more complete than that in Siberian Russia or else their indices of connectivity may be compared. Pupils are already being required to make some quantitative interpretations but only rarely as yet in respect of atlas maps. Here again teachers seem to be demanding of pupils less than these pupils are prepared to offer; many pupils wish to be more precise and to think more widely and more deeply than is expected of them. This disparity is all the greater when one considers only the highest order fundamental skills employed in each manipulation of the mapped symbols (Figure 6). For instance, a question requiring the fairly precise location of a particular town involves seeing and understanding the symbols as well as skill in the use of the co-ordinates. This last is the highest level skill and so in the reworked data this alone is counted. It will be seen that in free search children are very interested in the symbols themselves and want to go on to manipulate them, often precisely and numerically, and often making deductive and inductive interpretations, while their teachers more often take an understanding of symbols for granted and expect only the simpler, verbal use of them - simple descriptions of what the map directly puts into evidence.

The same kinds of pedagogic objectives in regard to mapwork are revealed by activities in mapwork books compiled for use with a particular, named, atlas, such as Hawkes' Looking into the Atlas for Wheaton's Middle School Atlas, or actually bound into the atlas, such as the Study Atlas by Workman out of Collins-Longman, only recently unavailable after a very long and successful run, while comparable objectives outside the United Kingdom can be found from Canada (in Crime's little School Atlas Maps) to India (in the Indian Book Depot's very useful and popular copy-out and fill-in Practical Geography.)

GUIDANCE ON ATLAS MAPWORK SKILLS IN DESK ATLASES AND ASSOCIATED PUBLICATIONS

For the purpose of analysing skill guidance from the assorted material it seems valid to accept the overt intention of the author (as revealed by headings and suchlike) rather than less objectively to attempt to disinter the unstated and perhaps unconscious objectives. Content guidance and all practice activities are ignored except for minimal in-context explanatory worked examples. Some kinds of guidance were disclosed that were not equivalent to the kinds of practice classified in Figures 4, 5 and 6, and so these form new categories in Figure 7. This mismatch is a pure accident arising naturally out of the nature of the samples chosen for analysis as there is logically and in practice a guidance category for every practice category. In Figure 7 there is sufficient information on ultimate interpretational skills and on quantitative techniques for these to be subdivided, but not so for qualitative techniques. There is no entirely valid means of counting each author's contribution of guidance but a fairly reliable one is to count pages and this has been done to the nearest one tenth of significant material.

Figure 1 shows that skills guidance may be found in an independent or unattached book (handbook and/or workbook), shared between atlas and book, or in a comprehensive atlas cum workbook, and selected examples of each ar analysed. The atlas cum workbook, in which the usual sharp distinction between the two has broken down, is rare. But it has had a long if sporadic history as in the Atlas Geographies published by the now defunct cartographic house of W and AK Johnston of Edinburgh, a series which contained much content guidance and skills practice, transparent overlay maps and both bound-in and loose-insert atlas maps. The current, widely-used New Rashistriya Atlas from the Indian Book Depot of Delhi retains this sort of concept in its combination of atlas map, thoroughgoing content guidance and more modest skills guidance. The potential effectiveness of this kind of publication is high as is demonstrated by the attention to objectival and interpretational skills in the one cited (Figure 7).

Most atlas companions are separately bound, however. They are non-obligatory to users of the atlas but cannot properly be used with any other, and are the characteristic approach of British publishers to the home market. Fill-in (or copy-out and fill-in) pupils' desk atlas workbooks are provided by Schofield and Sims (Checkpoint for Our World), Oxford University Press (A First Atlas Workbook for the Oxford First Atlas) and Collins-Longman (Atlas One and Two Workbooks for Atlas One and Two), and permanent ones by Nelson (Atlas 80 and Atlas Scotland Workbooks for Atlas 80 and Atlas Scotland) and Johnston and Bacon (Cassell) (Development Book 1 and 2 for the World Study Atlas). These are all largely providers of activities for the pupils to practice skills they already possess or are expected to learn through the activities, but the Development Books are atypical in containing much content guidance and Atlas 80 and Atlas Scotland Workbooks in providing a measure of skills guidance.

All these are for the use of relatively young children, and may be preceded by the so-called 'pre-atlas' workbook such as that of Collins-Longman's Let's Make Maps, a useful little fill-in book. Their only relevance to the theme of this paper is that their publishers might feel able to claim that any program of guidance in or associated with the atlas itself might be concertinaed. Other such works are sporadically published, eg. Hammond's pre-atlas Map Skills Readiness Book, full of skills guidance for largescale maps.

One of the finest pupils' desk atlas map workbook is Rigby-Philip's Student's Activity Book (by Lindsay Francis, Colin Green and Tony Milne) to go with The Australian Atlas, for which the first author was also a consultant. This was first published in 1978 and was followed in 1981 by Jacaranda's fine Activity Book (by Rodney Gerber) to go with the New Jacaranda Atlas. The former provides a fine blend of skills guidance and practice while the latter finds room for some objective skills and for much content guidance. This, together with their being associated with secondary level atlases, set them apart from the great majority of English examples. Nystrom's World Atlas Workbook is a different type again, providing limited forms of practice only. It is an exact counterpart of Hasse's Stordia 1-2 Arbejsblade, companion to its Atlas for Folkeskolen.

Superior to even the exemplary Australian atlas workbooks, or at least potentially so, are packages that contain not only an atlas but both a pupil's desk workbook and a teacher's desk handbook. The *Guide de Travaux Practiques*, for instance, is a fill-in, practice-only companion to *Mon Atlas* of Les Editions HRW Ltee. The pupils' material is actually bound into the handbook but is to be torn out and duplicated. Meulenhoff Educatief accompanies its secondary grade *Schoolatlas mavo/havo vwo* by a booklet of practical questions and activities, and by an updatable file of content guidance ably edited by Jan Abrahams and associate. More thorough going are the publications of Biblioteksförlaget in Stockholm. Their *Orienteeringsatlas* and *Studieatlas* are each accompanied by a very fine pupils' desk workbook ('*elevhafts*') of fundamental and interpretational skills and of content guidance, together with an even finer teacher's handbook ('*lararhandledning*'), both books being lavish with their contained atlas map extracts.

The finest packages of all are perhaps those published by Tei-koko Sho-in of Tokyo. This family of magnificant elementary, junior high and senior high school atlases are each accompanied by an even more magnificent teacher's desk atlas cum handbook ('*Shi-do-sho*'), made by binding copious guidance into the atlas, and, at junior high level the atlas, the *Chu-gak-ko Sha-kai-ka Chi-zu*, has also a pair of pupils' desk workbooks ('*Gaku-shu Haku-chi-zu*'), partly in colour, and for practice rather than for guidance.

From Geographisches Verlagsgesellschaft Velhagen & Klasing and Herman Schroedel comes a fine family of atlases. The various regional editions of their *Unsere Welt Grundschulatlas* are accompanied by a small but useful teacher's handbook of skills and content guidance and by a very fine map and air photo book with its own fine teacher's handbook of skills and content guidance. Pupils can progress through the *Unsere Welt Regionalatlas* (of West Germany) to the main *Atlas Unsere Welt* in various editions and for which a very competent teacher's handbook is available to offer guidance in content more than in map skills, and to suggest practice for pupils.

Georg Westermann Verlag also produce a very fine family of atlases and associated publications of which especial mention ought to be made of their Diercke Weltatlas (in several editions) and its Diercke Handbuch - perhaps the best such work yet produced and a mine of highly authoritative information for teachers, mainly on content but with some guidance on skills and some suggestions for pupils' practice. They also have a more modest 'lehrerband' for their Westerman Weltatlas. There are other German-language teacher's handbooks cast in the same mould, examples being the Lehrermaterialen for the List Grosser Weltatlas and for the List Schulatlas, the Lehrerbegleitbuch for Freytag and Berndt's Unterstufen Schulatlas, and the Final Report for the Schweizerischer Schulatlas of the Interkantonaler Lehrmittelzentral Konceptkomission.

A 'boswijzer' accompanies De kleine Bosatlas, the middle member of the famous family of Bos atlases of Wolters Noordoorf, and it is worth noting that Wolters of Groningen was one of the earliest to produce an atlas companion, Bos' Leerboek and his concise or Beknopt Leerboek der Ardrijkunde ("Textbook" and "Concise Textbook of Geography") for the original Bos' Schoolatlas de Ceheerde Erde, 1877. Less well known but particularly replete with skills guidance and suggestions for pupil activities is the fine little teacher's handbook by John Madden to be used with his My First Atlas, out of Hammond (Figure 7).

By far the larger number of pupils' desk atlases are accompanied by no desk book and it may be useful to select examples of these that are, in respect of the current enquiry, more or less representative of Dubut's types of atlas, a procedure that is all the more appropriate as guidance was discarded by her as a diagnostic feature. Dubut's 'atlas d'initiation' or 'first atlas' (her Group A) is intended for young children. When a wide selection of these is examined it is found that guidance, though not diagnostic, is frequent, sometimes extensive and generally distinctive in character. Evans Junior Atlas for Social Studies (Sandford 1980a) is better endowed than most in quantity, quality and balance. It illustrates informality in guidance, with children being helped to learn vicariously through the portrayed experiences of other children with whom they can identify. Pictures are incorporated and pupils induced to learn actively by the inclusion of judiciously selected exercises.

Dubut's 'B' type of desk atlas, her atlas de conception nouvelle, is characterised by the use of 'paysage' maps (landscape, environmental, geoscape or geographical maps (Sandford, 1979) and by bringing together suites of thematic maps to aid the elucidation of 'polythematic' or general maps, and frequently by including many cartograms, diagrams, and such like. Although cases in this Group do not generally include much guidance, it is needed, and occasionally provided, as with Bartholomew's very fully guided First Atlas of the Environment (Sandford, 1980b).

The third or 'C' the 'atlas classique a dominante topographique' or conventional atlas consisting largely of traditional, hypsometrically-coloured maps - rarely has much guidance any more than does the 'atlas classique thematisee' of the 'D' Group, wherein the maps are supplemented by much thematic material, cartograms and diagrams. Australian and Polish examples of these are given.

CONCLUSIONS

Regarding the relationship between atlas, workbook and handbook, it will be noticed that handbooks are more likely than workbooks or atlases to provide guidance on interpretational skills, and workbooks more than handbooks or atlases on objectival skills - and the examples in Figure 7 are typical of the difference. It may also be seen that there is no regularity whereby the presence of guidance in a desk book obviates it in an atlas (e.g. the American My First Atlas denies this) and there may be more duplication than complementation (e.g. the Swedish Studieatlas, and the Japanese Chu-gak-ko Sha-kai-ka Chi-zu).

The total amount of guidance tends to be greater in the following cases (the number of pages being inclusive of atlas and any associated book):

a) When there is a pupils' workbook and/or teacher's handbook as with the American and Japanese examples cited in the previous paragraph.

b) When there is non-traditional material as in Bartholomew's First Atlas of the Environment.

c) When the publications are of British and Australian, or of German and Scandinavian origin, such as the New Jacaranda Atlas.

d) When the atlas is intended for young children, such as Collins-Longman's Junior Atlas for New Zealand and the South Pacific.

and which can be compared to their Senior Atlas for New Zealand.

There is no concensus of opinion as to the nature and account of skills guidance to be provided, or in which kind of publication, but it does seem (despite some excellent examples to the contrary) that guidance is generally too little and that it is ill-balanced when matched against either pedagogic or private interests. (Sandford 1980c, 1981a, 1981b) A more determined effort to bring these into line is suggested.

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TACTUAL MAPPING AND THE "BOLD ATLAS OF AUSTRALIA"

John Roberts*

Abstract

Recent cartographic developments have considered the possibility of providing maps for all sorts of users. The visually handicapped users are one special group for which maps are being designed. This paper consideres the special design requirements for tactile maps and details recent developments throughout the world. Its main emphasis is to outline the approach and design of the Bold Atlas of Australia for visually handicapped users.

TACTUAL MAPPING

The Australian Institute of Cartographers became involved in Tactual Mapping for the blind some two years ago. Each state committee formed subcommittees, with agencies of the blind formulating and investigating maps and diagrams required by the blind or the visually impaired.

Tactual maps are read with the movement of the whole hand or even with two hands by the blind or visually impaired. These types of maps are also known as "tactile" or "raised line" maps.

In Perth, Western Australia, the Australian Institute of Cartographers is preparing maps for the blind by using a new process known as puffed ink. After printing, using the silk screen method, the ink on the paper is heated and rises, becoming tactual. The advantage of this system to date is that there are no limitations as to size. A full range of patterns has been tested for the blind for their acceptability.

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* John Roberts is the Chief Cartographer of the University of Sydney, Department of Geography.

In Melbourne; Andrew Turk of the AIC, Dr Jack Massey and John Poliness of Melbourne University have been working with the Royal Blind Society on an Agricultural and Pastoral Land Use Atlas in Victoria. In the preparation of this atlas a full research programme was undertaken to ascertain suitable patterns for the use of not only the blind but for people with low vision. A computer was used to select class intervals from statistical data and displayed on a computer graphics screen to confirm suitability. The information was then plotted and a negative was made with braille cut into it. An etched zinc plate was made and small holes drilled into it. Thermoform clear plastic copies were printed by heating pieces of plastic over the map plate whilst creating a vacuum beneath the plate.

A paper print with bold lettering was also made and a similar process made for a location map of Victoria with town names in braille and bold print. The plastic tactual sheets and low vision paper prints are then fitted together back to back, all in registration.

This type of map is read tactually by both hands one to locate locality and the other to examine Agricultural and Pastoral Land Use.

In Japan a new process has been produced by Minolta; the "Minolta" Stereocopying system. A photocopier uses a special copying paper which is coated with hundreds of millions of thermally-foamed microcapsules which look like wheat flour. The photocopy is developed in a second machine which converts the flat image into a well-defined three-dimensional image for finger tip reading. The process takes only about 15 seconds and the depth of raised images can be controlled. A limitation to this type of machine is that it uses only A4 size paper, and line thickness and patterns have to vary to enable a reader to distinguish the patterns.

This system is being used by the Victorians with their computer assisted tactual mapping to provide a rapid method of producing simple, small formal tactual maps and other graphics. The Victorian Government has involved inmates of Pentridge Prison in tactual map production and a prison industry is being established.

In New South Wales, volunteers of the Central Mapping Authority, Bathurst have completed a seven map tactual series of Sydney Central Business District and, at present, a tactual map of the Sydney Metropolitan Area is being prepared showing transport routes and major suburban centres. Plans of shopping centres and Sydney Airport terminals are under preparation by Sydney AIC Institute volunteers.

NSW Division of AIC are preparing maps by using the Nottingham Kit which was developed in Nottingham, England. It consists of materials such as wire for roads, twisted wire for expressways, gauze for water, sand paper for parks, patterns for malls, traffic lights and buildings. A clear plastic material is used as a base. The cartographers produce a drawing to scale at a thermoform size of 250 x 265mm and from this the clear film from the kit has doubled sided tape laid on it. The patterns are then stuck down on the base material, tracing the original drawing. The exposed adhesive is removed by sprinkling ground glass over it. Thermoform copies (plastic prints) are then made from the master. The masters have been deposited with Guide Dog Associations of NSW and are readily available.

The Canberra Division of AIC is also using the thermoform system but they use nyloprint plates instead of the Nottingham Kit. A master drawing is drafted by the cartographers and a negative is made photographically. The nyloprint plate is made from the negative, the unexposed areas being removed, leaving the exposed areas raised. The plate is then drilled before thermoform copies are made under vacuum. The nylon is on a aluminium plate and this type of process is used in the Newspaper industry. An advantage of the nylon plate is that it can be stuck on a wall and felt without damage.

The Australian Institute of Cartographers has instigated a Nationwide Working Group on Tactual Mapping and they will be presenting their work procedures to a seminar in conjunction with the Australian Association of Workers with the Visually Impaired and the Orientation and Mobility Instructors Association of Australia in Melbourne, on the 27th March 1983.

In 1984 the AIC is hoping to introduce at the ICA Conference in Perth Tactual Mapping to the International Cartographic Association list of Commissions with terms of reference and hopefully an Australian Chairman.

Bold Atlas of Australia

As President of the NSW Division of the Australian Institute of Cartographers, I became involved in our sub-committee on Tactual Maps after the seven map Series of Sydney CBD was completed and I approached the Premier of NSW, Mr Neville Wran, requesting government assistance in the production of tactual maps. Mr Wran agreed that this was both important and necessary in helping the visually handicapped and he authorised that at the discretion of the Director of the Central Mapping Authority two days per week be set aside for work on tactual mapping.

This is a very important breakthrough and aid, not only to the visually impaired, but to the teachers and mobility instructors of the various agencies who now see the Cartographers participation as a helpful one.

At a committee meeting it was pointed out that the majority of visually impaired are not blind but are able to read very bold print. As a cartographer working in education, making slide masters in a bold format, the idea of a geography atlas of Australian Resources was born. It would be named *"The Bold Atlas of Australia"*.

The opinions of various geographers, school teachers and educators were sought and it was decided that an atlas of this type would be very successful. It would not only be a help to students but also as a teaching aid. The atlas would contain approximately 42 maps each being in a simplified form and containing only one subject at a time.

Existing atlases tend to complicate maps by having too many themes. For example, soil maps show all the soil types without classification to climate, whereas in the bold atlas, soils will be classified to climate, into a simplified six categories. Agricultural maps in atlases show beef, sheep, mixed farming, crops, forest and irrigation areas all on the one map which is too complex for the average student to decipher, whereas the bold atlas will have one map for each subject.

The atlas will be prepared from information from National Mapping Australian Resources Atlas and will cover the following subjects:

1. Continents of the World
2. Australia and its neighbours
3. Oceans and depth showing fishing zones
4. Seas surrounding Australia and water features
5. State boundaries and capital cities
6. Major towns
7. Landforms (contours)
8. Mountain ranges (pictorial)
9. Major rivers
10. Major deserts
11. Vegetation
12. Soils
13. Geology by era
14. Sedimentary basins (economic Geology)
15. Solid Geology showing oldest age of rocks
16. Drainage divisions and irrigation areas [illegible].
17. Major climatic zones

18 Average (median) annual rainfall

19 Summer average and Winter average rainfall

20 Average annual temperature

21 Summer average temperature and Winter average temperature

22 Heat discomfort (humidity) and frost period

23 Typical weather map (Summer)

24 Typical weather map (Winter)

25 Growing period

26 Sheep grazing areas

27 Cattle grazing areas

28 Weat farming and other crops

29 National Parks and Reserves

30 Metallic minerals

31 Non-metallic minerals

32 Iron ore mines, iron and and steel plants and shipments

33 Oil, natural gas and uranium

34 Oil refineries and seaboard bulk storage installations

35 Coalfields

36 Population

37 Major roads and shipping routes

38 Major railways

39 Major air routes

40 Comparison size of Australia

41 Historical discoveries of Australia

42 Historical settlements of Australia

Copyright clearance has been obtained from National Mapping and an ISBN 0 909764 07 7 has been allotted by the National Library of Australia.

Ashton Scholastic Publishers, after investigations of the higher primary and lower secondary school markets, have agreed to publish the atlas which will be produced in an A3 format for normal children as well as being suitable for visually impaired children and adults and senior citizens.

A quantity of maps have already been completed. An index of the style used can been seen in reduced form in Figures 1, 2, 3, 4 and 5. The completed maps use colour tones; blue for oceans, and orange for land. Orange was selected because it is already being successfully used with overhead projectors in visually handicapped schools for general student use and with colour blind students.

The coloured maps were tested with students of St. Edmunds and North Rocks Visually Handicapped Schools to evaluate colour and letter size. Following research by G.J. Matthews** 1978 and A. Turk** 1982 helvetica lettering style was used, with a minimum size of 18 pt in upper and lower case. The space between letters has been increased to alleviate the problem of letters joining together when seen by the visually impaired.

Little difficulty was experienced in reading letters, even though some children could read only one letter at a time with their eyes approximately 2-4cm away from the map. Colour defective children saw the orange as red, but could still see the black lettering.

A letter and questionnaire, (copy attached) was forwarded to all Australian Institutions involved with the visually handicapped and from this the general comments were: "Sounds like a good idea to fill an obvious need" or "Congratulations!, Excellent idea and long needed". At present we discourage our secondary students from studying Geography because of difficulties experienced in mapping, so this could make a big difference".

At this stage the atlas is now being prepared by myself and my assistant Johanna de Roder. It is being compiled from various maps held within the University's map library. Maps are simplified then reduced to A3 size photographically and drawn in ink on drafting film. Lettering is done on a Stripprinter and colour negative overlays are cut out of "K and E's" peel coat, all in registration.

Geographers of this department will edit and notate on each map in their field. The notation will then be audio taped onto cassette. There will be two tapes available; one for schools and the other for the visually handicapped.

A student can examine the atlas in its simple form and then increase his knowledge with the additional information on cassette.

It is hoped that the atlas will sell for about $5.00 ($8.00 with cassette.

Publication is anticipated by the middle of 1983.

The Canberra Division of the Australian Institute of Cartographers will be making the atlas available in tactual form for use by the blind. The cassette will also be an obvious benefit in understanding the atlas.

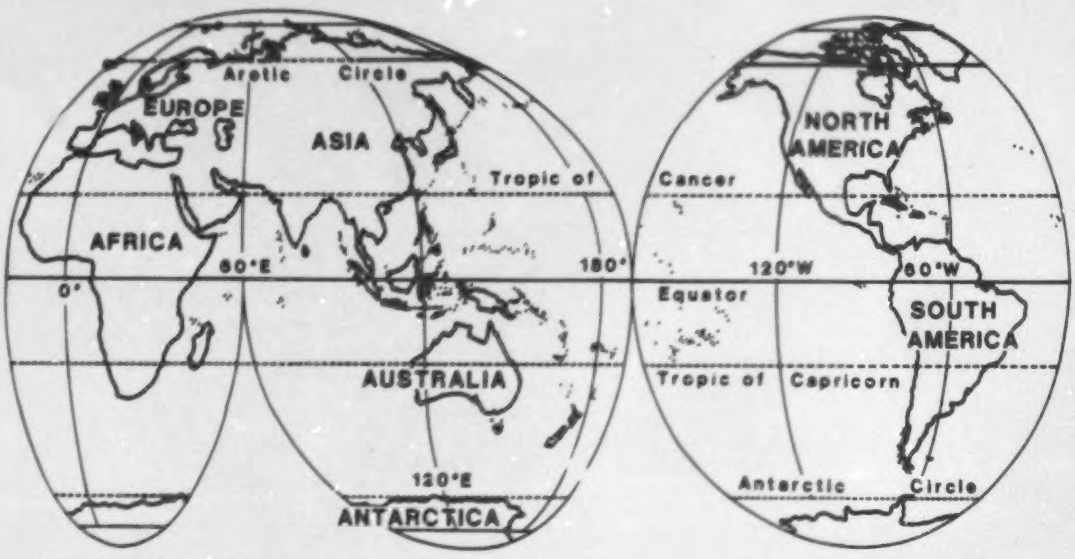
Arctic Circle
EUROPE
ASIA
NORTH AMERICA
Tropic of Cancer
AFRICA
60°E
180°
120°W
60°W
0°
Equator
SOUTH AMERICA
AUSTRALIA
Tropic of Capricorn
120°E
Antarctic Circle
ANTARCTICA

Figure 1: CONTINENTS OF THE WORLD - Map 1
(Projection: Mollweide's Homolograph)
(Blue ocean areas, orange land areas on white background)

0 2000
km

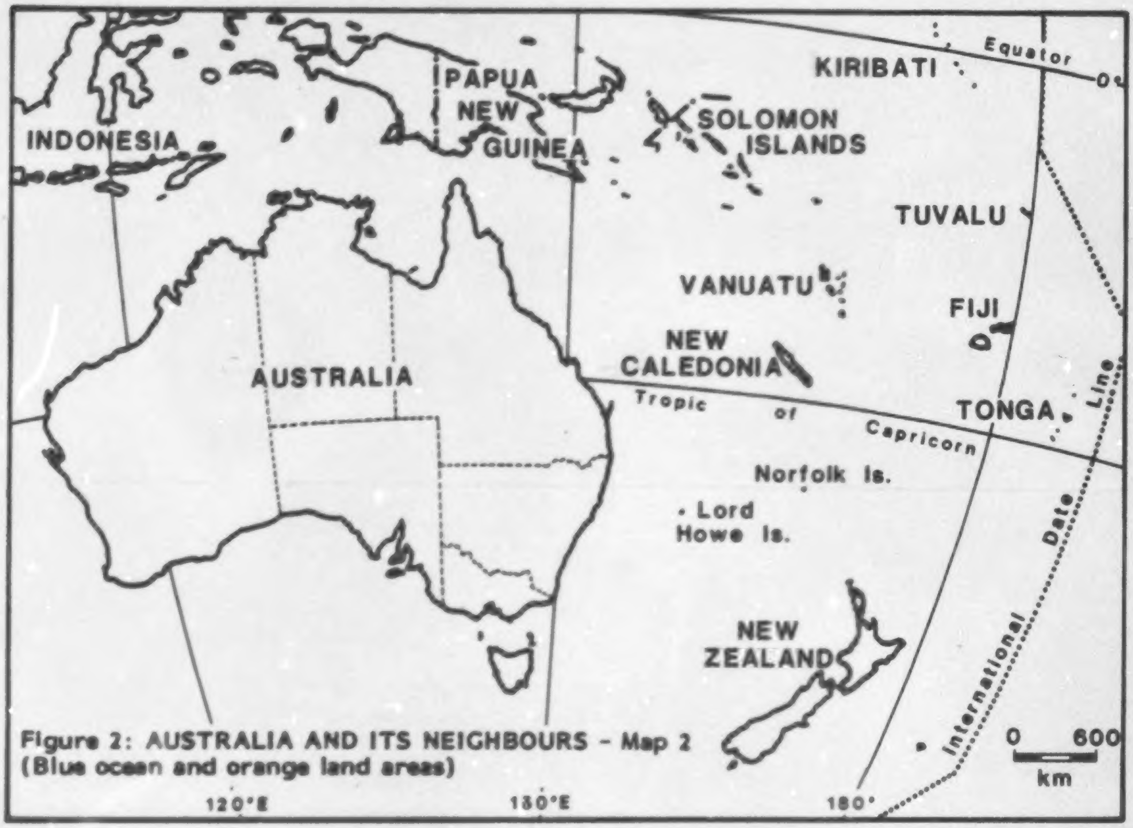
PAPUA NEW GUINEA
KIRIBATI
Equator
0°
INDONESIA
SOLOMON ISLANDS
TUVALU
VANUATU
FIJI
NEW CALEDONIA
AUSTRALIA
Tropic of Capricorn
TONGA
Norfolk Is.
Lord Howe Is.
International Date Line
NEW ZEALAND
0 600
km
120°E
130°E
180°

Figure 2: AUSTRALIA AND ITS NEIGHBOURS - Map 2
(Blue ocean and orange land areas)

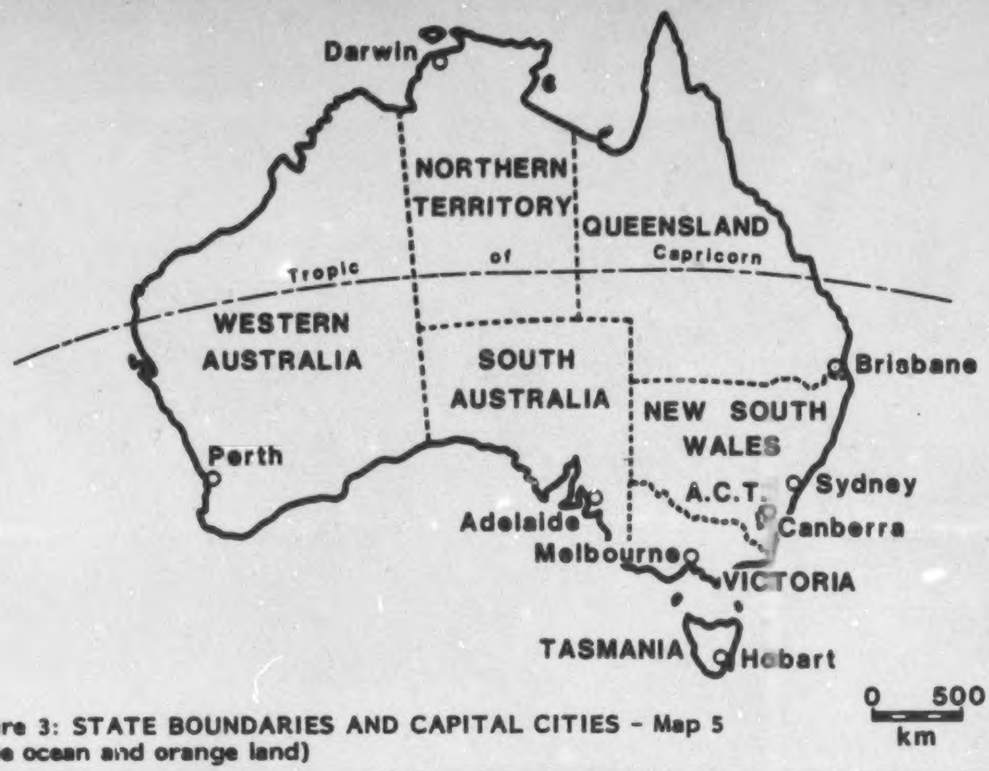
Darwin
NORTHERN TERRITORY
QUEENSLAND
Tropic of Capricorn
WESTERN AUSTRALIA
SOUTH AUSTRALIA
Brisbane
NEW SOUTH WALES
Perth
A.C.T.
Sydney
Adelaide
Canberra
Melbourne
VICTORIA
TASMANIA
Hobart
0 500
km

Figure 3: STATE BOUNDARIES AND CAPITAL CITIES - Map 5
(Blue ocean and orange land)

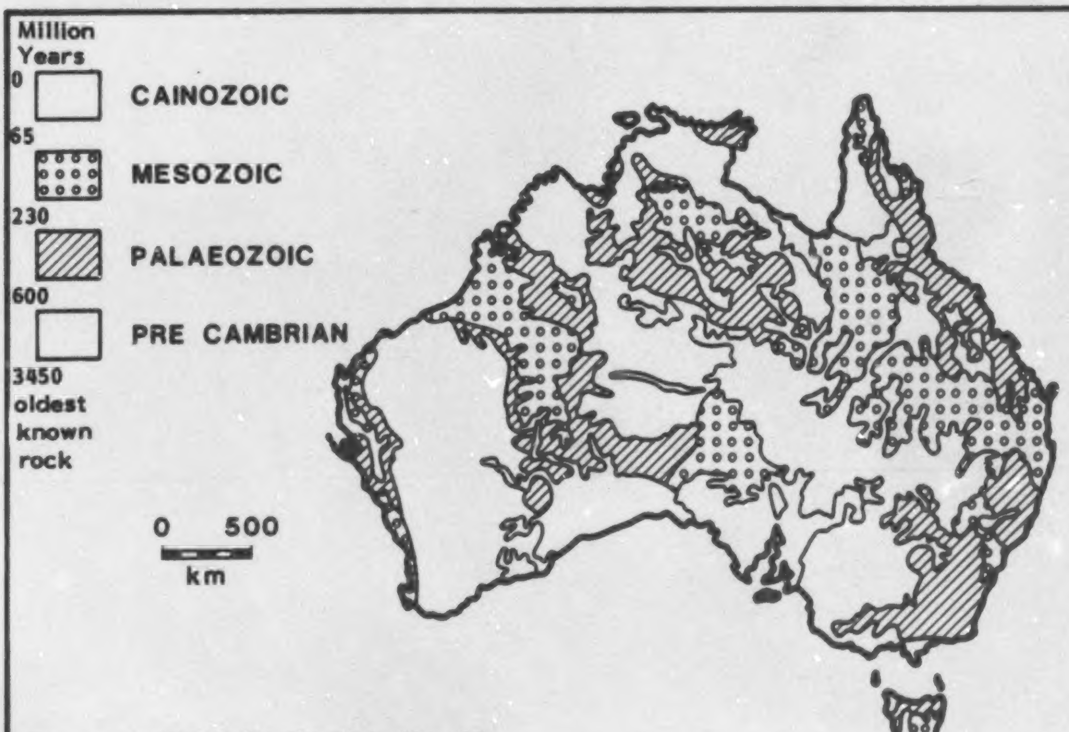
Million Years
0
CAINOZOIC
65
MESOZOIC
230
PALAEOZOIC
600
PRE CAMBRIAN
3450 oldest known rock
0 500
km

Figure 4: GEOLOGY BY ERA - Map 13
(Cainozoic white, Mesozoic orange dots, Palaeozoic orange and white strips, Pre- Cambrian orange)

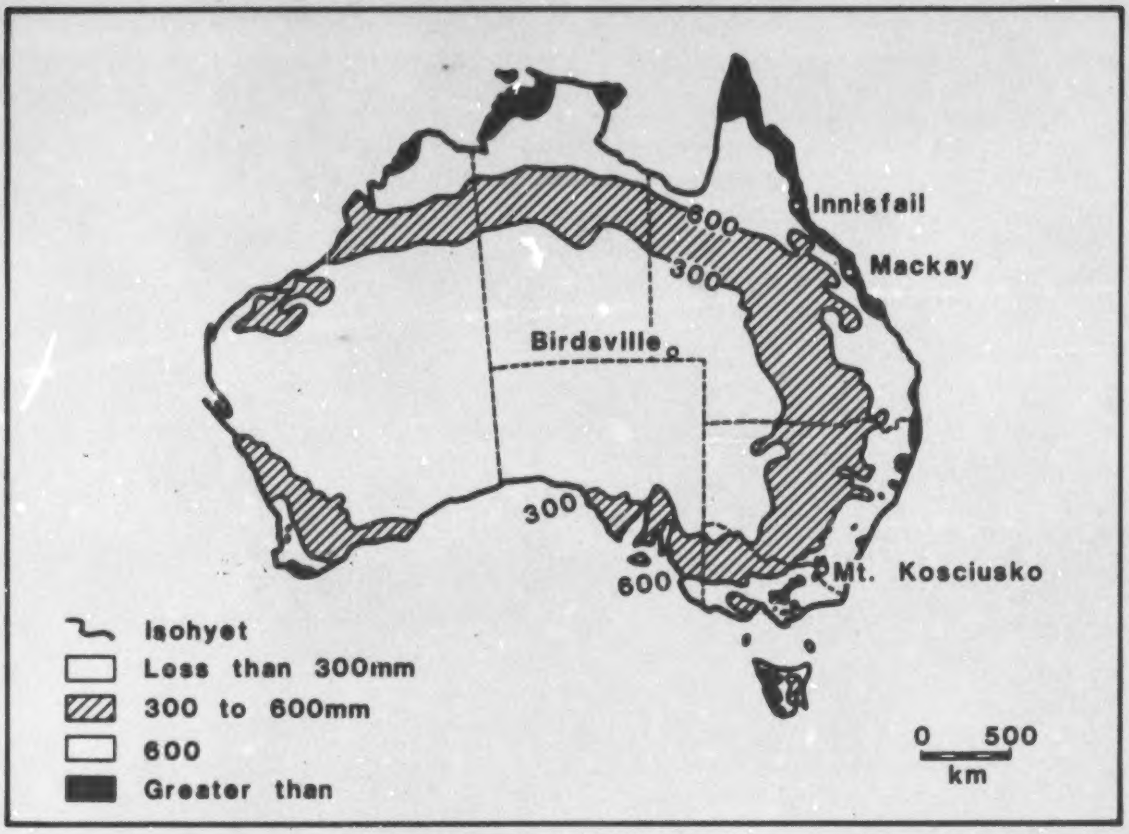
Innisfail
Mackay
600
300
Birdsville
300
600
Mt. Kosciusko
Isohyet
Less than 300mm
300 to 600mm
600
Greater than
0 500
km

Figure 5: Average Annual Rainfall - Map 18
(Less than 300 mm white, 300 to 600mm orange and white strips,
600 to 1200 mm orange, greater than 1200mm black)

NOTE : On Figures 1 to 5 titles and map numbers are still to be completed also rainfall legend.

THE UNIVERSITY OF SYDNEY

Department of
Geography

SYDNEY, NEW SOUTH WALES
AUSTRALIA 2006

Telephone: 692 1122

Dear Sir/Madam

I wish to inform your organization that I am going to prepare an atlas of Australian Resources in bold print for the low vision children and people of Australia.

I am the president of the NSW Division of the Australian Institute of Cartographers, and am presently on a joint committee with the NSW agencies for the Blind and Institute of Cartographers involved in Tactual mapping in NSW. From this involvement I have discovered the need for an atlas in bold print for the visually impaired.

The atlas will be known as the "Bold Atlas of Australia" by John E. Roberts, MAIC, Department of Geography, University of Sydney, and will consist of the following maps and subjects which follow the general school syllabus and guidelines.

1. Continents of the World
2. Australia and its neighbours
3. Oceans (using base from 2) and Bathymetry
4. Seas surrounding Australia (plus latitude and longitude)
5. State boundaries and capital cities
6. Major towns
7. Landforms (Contours)
8. Mountain Ranges (pictorical)
9. Major rivers
10. Deserts
11. Vegetation
12. Soils
13. Geology by age of units
14. Sedimentary basins (Economic Geology)
15. Geological units by rock type
16. Drainage divisions and Irrigation areas
17. Major climatic zones
18. Average (median) annual rainfall
19. Summer average annual rainfall
20. Winter average annual rainfall
21. Average annual temperature
22. Summer annual temperature (Max. and Min.)
23. Winter annual temperature (Max. and Min.)
24. Heat Discomfort (humidity)

25. Typical weather map (Summer)
26. Typical weather map (Winter)
27. Soil moisture index (Summer and Winter)
28. Sheep grazing
29. Cattle grazing
30. Wheat farming
31. Other crops
32. Fishing limits of Australia
33. Minerals (Ore bodies)
34. Oil, Natural Gas and Uranium
35. Coal
36. Population
37. Roads
38. Railways
39. Shipping
40. Air routes
41. Comparison size of Australia
42. Historical discoveries of Australia

Copyright clearance has been obtained from National Mapping and an ISBN 0 909764 07 7 has been allotted by the National Library of Australia.

I have prepared five maps for the atlas and they are going to be used at North Rocks Central School for Blind Children and St. Edmund's Wahroonga to evaluate the colour being used and size of lettering. Professor Lederer of the Royal Blind Society, Enfield will also comment on the format of mapping and colour. At this stage the format is black lettering and bold black lines, orange to denote subject and blue to represent water around Australia. Final colour tone selected will be subject to these tests and recommendations.

I have enclosed a zerox copy of these maps (not coloured) for your information.

To make this a viable project it is my intention to aim the atlas at primary school level as each map is simple and self explanatory. For secondary students a cassette tape will be available with comments and explanations from lecturers in this department to relevant details on the subject. By obtaining education acceptability the atlas will be available for a reasonable price hopefully for less than $8.00 with a tape and $5.00 on its own.

To help me ascertain the viability of the atlas could you please return the attached form giving an indication as to your interest in the atlas and to the possible numbers required by your institute or the possible number required by known users.

It is planned to have the artwork completed early next year and the atlas published later in the year. It is also my intentions to have the Australian Institute of Cartographers produce the atlas in Tactual form for the Blind.

Any other comments would be appreciated.

Yours faithfully

John E. Roberts

John E. Roberts, MAIC
Cartographer

Please return form to

JOHN ROBERTS, CARTOGRAPHER
DEPARTMENT OF GEOGRAPHY
UNIVERSITY OF SYDNEY
SYDNEY NSW 2006
AUSTRALIA

☐ INTERESTED

☐ NOT INTERESTED

☐ APPROXIMATE NUMBER REQUIRED BY INSTITUTION

☐ APPROXIMATE NUMBER REQUIRED BY OTHERS

Comments ______________________________

____

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Signed ______________________________

Institution ______________________________

After completion of the "Bold Atlas of Australia" it is my intention to produce another Bold Atlas on Australia's Neighbours. This will satisfy new 1983 NSW geography syllabus and will cover resources of New Zealand, New Caledonia, Fiji, Vanuatu, Tuvalu, Tonga, Solomon Islands, Papua New Guinea, and Indonesia.

Educators in PNG and NZ have already indicated a market potential for this to Ashton Scholastic publishing company. Should the "Bold Atlas of Australia" be successful, other publications are envisaged such as a Resources Atlas of Australian States, and a World Continent Resources Series but these will only be published if the public accepts the Bold Atlas idea.

References

**G.J. Matthews, 1978, 3rd Australian Cartographic Conference, Brisbane "An Atlas of Canada for the Visually Handicapped"

**A. Turk, 1982, 10th Annual Conference, The Australian Map Curators Circle, Canberra, "Tactual Mapping".

STUDENTS' ABILITIES TO TRANSFORM VERBAL AND VISUAL INFORMATION IN GEOGRAPHY

Rod Gerber and Nea Stewart-Dore *

ABSTRACT

This paper introduces the concept of children's transforming printed information in their studies of geography. It also details a study conducted by the authors with a group of English school children into their abilities to draw maps from a written statement after reading a map. The results of this study indicate that there are substantial differences in children's abilities to make visual and verbal transformations in geography.

INTRODUCTION

Students in geography are required to process a wide range of print information in their studies. This information may consist of written statements, graphic presentations including diagrams, graphs and maps, and tables of statistics. A crucial pedagogical problem in using various forms of print information for learning purposes in geography is to discover the means by which teachers can help students to process such information effectively to realise specific learning objectives. Learning using print information occurs when geography students extract, organise and translate what they read into forms of information which suit the students' needs and purposes. As Merritt et al (1977, 14) argue, translated forms of information may differ from the way in which the original information is presented. For example, geography students may write a paragraph on urban problems after reading maps of cities showing transport movement, atmospheric pollution and population distribution, as well as examining a selection of relevant photographs. Alternatively, the students may draw a graph of traffic move-

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* Dr Rod Gerber and Mrs Nea Stewart-Dore are lecturers in the School of Teacher Education, Brisbane College of Advanced Education (Kelvin Grove).

ments in a city after reading an apt written description of traffic flows in a city.

Morris and Stewart-Dore (1980) have incorporated the concepts of extracting, organising and translating information into their model for effective reading in content areas. Their usage of extracting and organising information focuses on strategies teachers may use to develop student competencies in transforming information from one form to another aspect of learning how to learn. Morris and Stewart-Dore suggest strategies to help students develop their abilities to represent text passages in diagrammatic forms such as flow diagrams, retrieval charts and graphs. Research studies by Fry (1981), Geva (1981), Merritt (1975, 1976 and 1977) and Merritt, White and Moore (1978) have demonstrated the effectiveness of using such diagrammatic representations of both expository and narrative prose for a variety of learning purposes.

The conclusions that can be drawn from these studies imply the need for students to develop graphic literacy and to become competent in using a variety of strategies to derive personal meaning and knowledge from information presented in different print forms. The plea for students to develop graphic literacy underlies the educational publications of Atkins (1978) and Fry (1981). The terms encoding and decoding are useful to describe the processes of making meaning of the signs drawn on maps (Gerber, 1980). Gerber defined the process of understanding cartographic language as the identification of individual signs followed by the comprehension of these signs. The process of comprehension of cartographic signs consists of knowing each sign in context (i.e. on a map), out of context (i.e. in isolation as in a legend), understanding the concept represented by the sign and being able to draw inferences from it.

Traditionally, the terms encoding and decoding have also been used to explain something of what readers do when they attempt to make sense of continuous prose. Goodman (1976 (a) and 1976 (b)) however, dissuades us that reading involves principally identification, and decoding of discrete elements (symbols) in print, and suggests that efficient readers merely sample what graphic information is necessary to prompt the use of linguistic cues to predict and create meaning. Thus, efficient readers move directly from graphic symbols encoding the sense of a passage to meaning. There may well be little difference between the processing of verbal and graphic symbols.

Since geography teachers and students use a wide range of print materials in teaching and learning, it seems worthwhile to investigate some of the ways geography students extract and organise information. It is likely that the students' extraction and organisation of information will involve their transforming the information into another form, e.g. creating a graph from a set of statistics. What would be most helpful would be to find out what transformations students make in geography and the processes by which the students complete each transformation.

A STUDY

The study reported here represents an initial attempt to investigate geography students' abilities to engage in and to complete verbal and visual transformations. Verbal transformation is the process by which geography students read a map, decode its message and express its meaning in a written passage. Visual transformation is the reverse process by which geography students read a written passage, interpret its meaning and draw a map or diagram to represent the writer's message graphically. The study focused only on students' abilities to draw maps from written statements and conversely, to make written statements after reading maps. No attempt was made to probe the processes by which students completed their verbal and visual transformations.

This pilot study was conducted with two classes of students from a secondary school in Plymouth, England. The composition of the study group is detailed in Table 1. Thirty students of equal numbers of boys and girls in each of Forms 1 and 3 participated in each task of the study. The average age of the students was 11·9 years for Form 1 and 14·3 years for Form 3.

Table 1: COMPOSITION OF STUDY GROUP

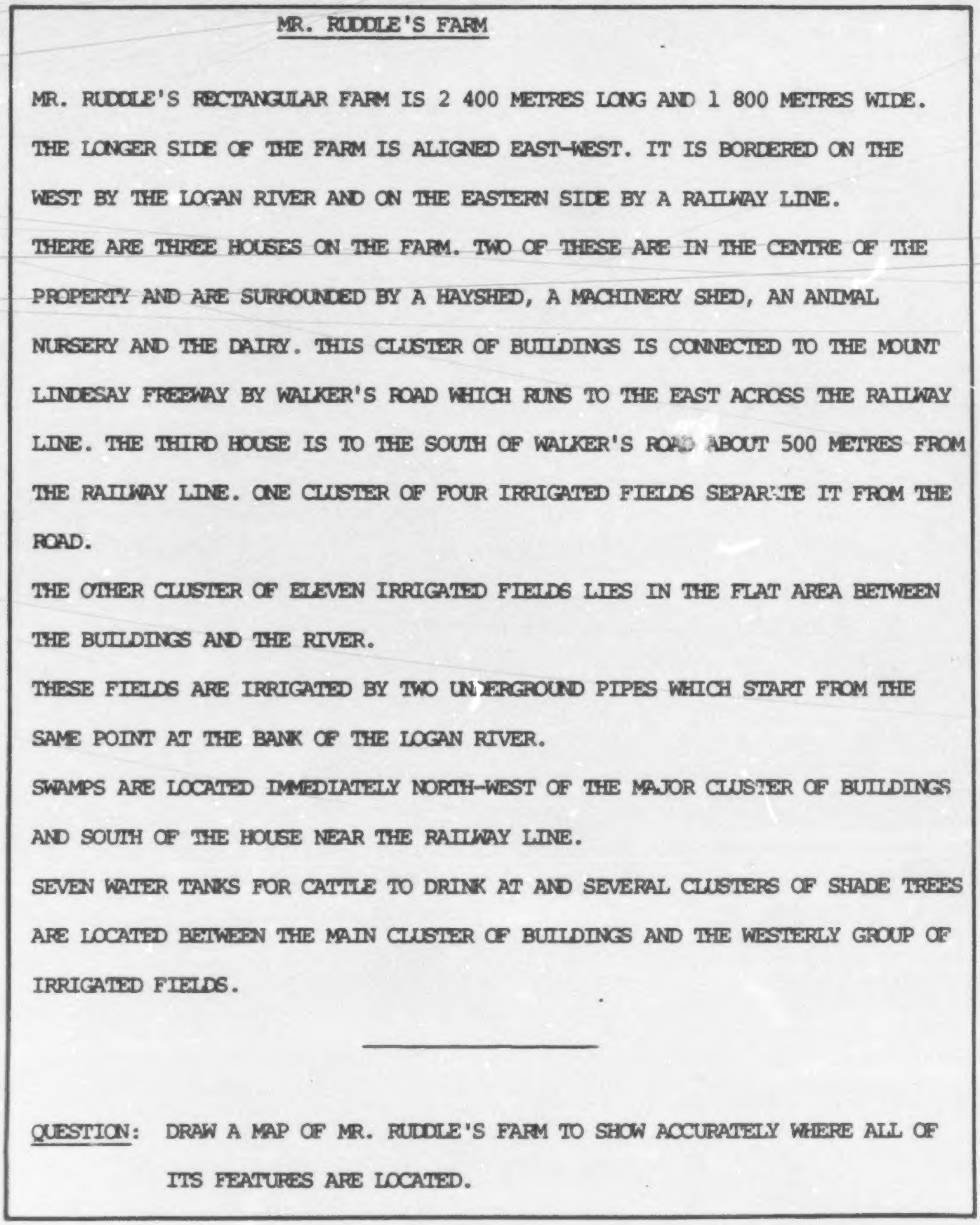
Form	Mean Age (Years)	Sex		Number of Children
		Male	Female	
1	11·99	15	15	30
3	14·27	15	15	30

The students completed three sets of tasks to produce a verbal and a visual transformation in each set. These tasks were devised to reflect three ways of organising information coherently. The first task derived from information which required students to draw and write from explicit information. The second task reflected cause-effect relationships and required students to explain reasons for the relationships graphically and in writing. The final task, relating to Eskimo hunting grounds, demanded that students make inferences from information implied by given text to map.

The actual instruments for this study consist of sets of matching written statements and maps designed to match these organisational patterns. Each map and written statement is accompanied by a designated task which is used to direct the students in their transformation task. The verbal and visual transformation tasks derived from explicit information are illustrated in Figures 1 and 2 with information about Mr Ruddle's farm. The geographical information, here, is concerned with the location of the farm and the main features on the farm. The verbal and visual transformation tasks requiring explanations about cause-and-effect relationships focus on information about the suburb of Beneen in a city. The written statement is illustrated in Figure 3 and the map is presented in Figure 4. Finally, the verbal and visual transformation tasks requiring inferences to be made are presented in Figures 5 and 6. Information in these tasks focuses on the hunting areas of a typical Eskimo village. Students are required to draw inferences about the seasonal hunting activities of Eskimos, from the information in the written statement and the map.

The six tasks were administered to the two classes of geography students in a random order and were spaced over a four week period so that any practice effects would be minimal. Students were allowed a time of approximately thirty minutes to complete each transformation task.

Criteria for evaluating the students' ability to complete verbal and visual transformations in geography may be extablished by considering relevant geographical concepts, the elements of graphics such as maps and the processes which students use to construct transformations. These criteria are listed in Figure 7. For verbal transformations, students are assessed on their ability to write a coherent written statement which includes evidence of their understanding of: the arrangement of features on the map; the structural integrity of the main features on the map (i.e. the combination of features reflects the way these features are organised on the map); the use of directions to locate features; the understanding and use of scale and proportion as



MR. RUDDLE'S FARM

MR. RUDDLE'S RECTANGULAR FARM IS 2 400 METRES LONG AND 1 800 METRES WIDE. THE LONGER SIDE OF THE FARM IS ALIGNED EAST-WEST. IT IS BORDERED ON THE WEST BY THE LOGAN RIVER AND ON THE EASTERN SIDE BY A RAILWAY LINE.

THERE ARE THREE HOUSES ON THE FARM. TWO OF THESE ARE IN THE CENTRE OF THE PROPERTY AND ARE SURROUNDED BY A HAYSHED, A MACHINERY SHED, AN ANIMAL NURSERY AND THE DAIRY. THIS CLUSTER OF BUILDINGS IS CONNECTED TO THE MOUNT LINDESAY FREEWAY BY WALKER'S ROAD WHICH RUNS TO THE EAST ACROSS THE RAILWAY LINE. THE THIRD HOUSE IS TO THE SOUTH OF WALKER'S ROAD ABOUT 500 METRES FROM THE RAILWAY LINE. ONE CLUSTER OF FOUR IRRIGATED FIELDS SEPARATE IT FROM THE ROAD.

THE OTHER CLUSTER OF ELEVEN IRRIGATED FIELDS LIES IN THE FLAT AREA BETWEEN THE BUILDINGS AND THE RIVER.

THESE FIELDS ARE IRRIGATED BY TWO UNDERGROUND PIPES WHICH START FROM THE SAME POINT AT THE BANK OF THE LOGAN RIVER.

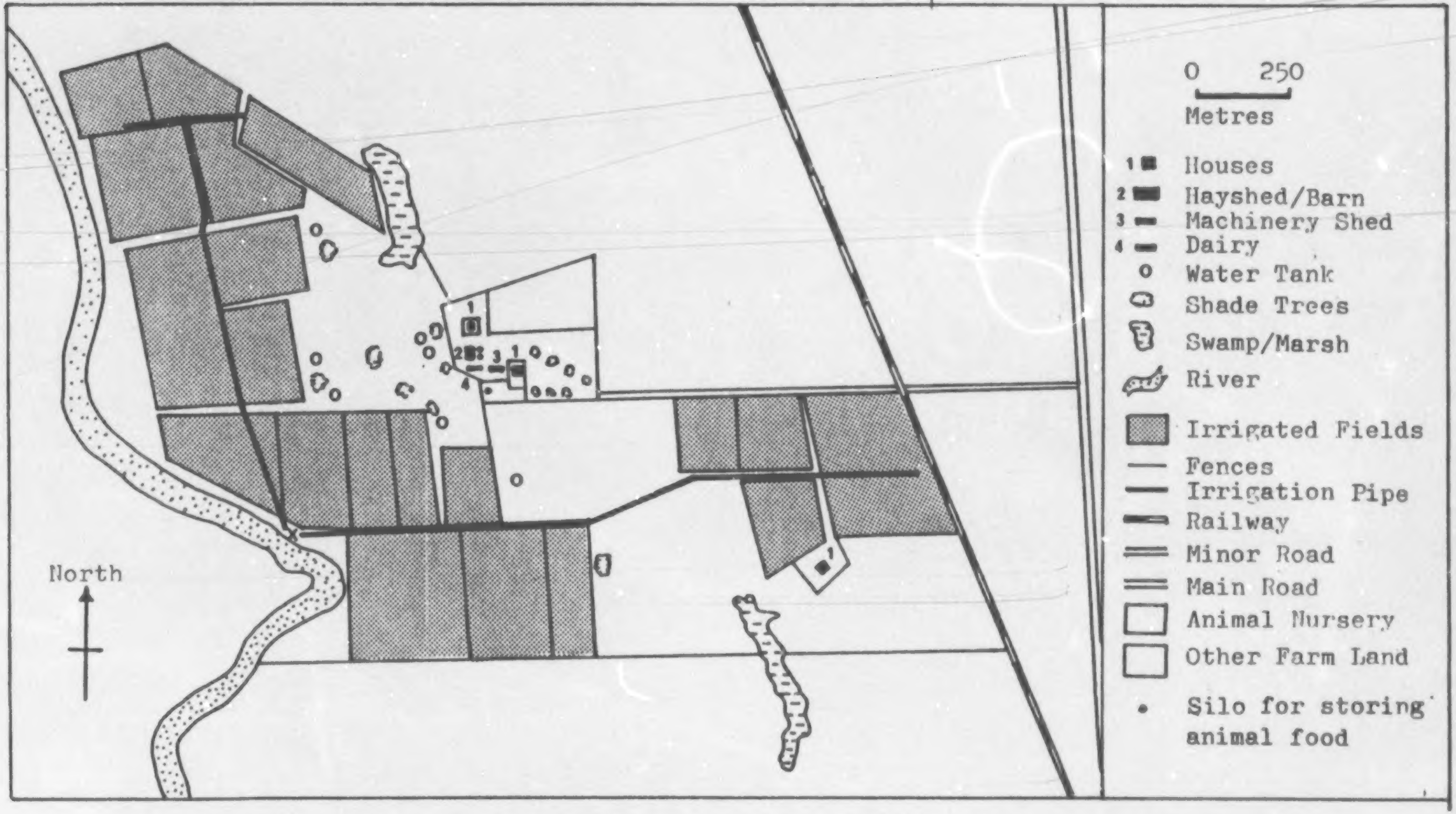
SWAMPS ARE LOCATED IMMEDIATELY NORTH-WEST OF THE MAJOR CLUSTER OF BUILDINGS AND SOUTH OF THE HOUSE NEAR THE RAILWAY LINE.

SEVEN WATER TANKS FOR CATTLE TO DRINK AT AND SEVERAL CLUSTERS OF SHADE TREES ARE LOCATED BETWEEN THE MAIN CLUSTER OF BUILDINGS AND THE WESTERLY GROUP OF IRRIGATED FIELDS.

QUESTION: DRAW A MAP OF MR. RUDDLE'S FARM TO SHOW ACCURATELY WHERE ALL OF ITS FEATURES ARE LOCATED.

Figure 1: VISUAL TRANSFORMATION TASK USING EXPLICIT INFORMATION

PLAN OF MR. RUDDLE'S FARM


1
2
3
4
North
0 250
Metres
1 Houses
2 Hayshed/Barn
3 Machinery Shed
4 Dairy
Water Tank
Shade Trees
Swamp/Marsh
River
Irrigated Fields
Fences
Irrigation Pipe
Railway
Minor Road
Main Road
Animal Nursery
Other Farm Land
Silo for storing animal food

QUESTION: WRITE A DESCRIPTION OF MR. RUDDLE'S FARM TO SHOW WHERE EVERYTHING IS LOCATED ON THE FARM.

Figure 2: VERBAL TRANSFORMATION TASK USING EXPLICIT INFORMATION

BENNEEN - LAND USES

BENNEEN IS BORDERED BY THE BENNEEN RIVER TO THE NORTH AND WEST, AND BY THE MAIN FREEWAY TO THE EAST. BECAUSE THE AREA IS PRONE TO FLOODING, PARKS LINE THE RIVER BANK AND A SPORTING COMPLEX BACKS ON TO THE FREEWAY. A GOLF COURSE, A BOWLS CLUB, AN ALL-SPORTS CENTRE AND A SWIMMING POOL FORM THE SPORTING COMPLEX.

BENNEEN IS A HOUSING ESTATE. THE FIRST HOUSES WERE BUILT FACING THE FAVOURABLE NORTH TO NORTH-EASTERLY ASPECT, LEAVING THE WESTERLY HILLS AREA TO BE THE LAST TO BE DEVELOPED.

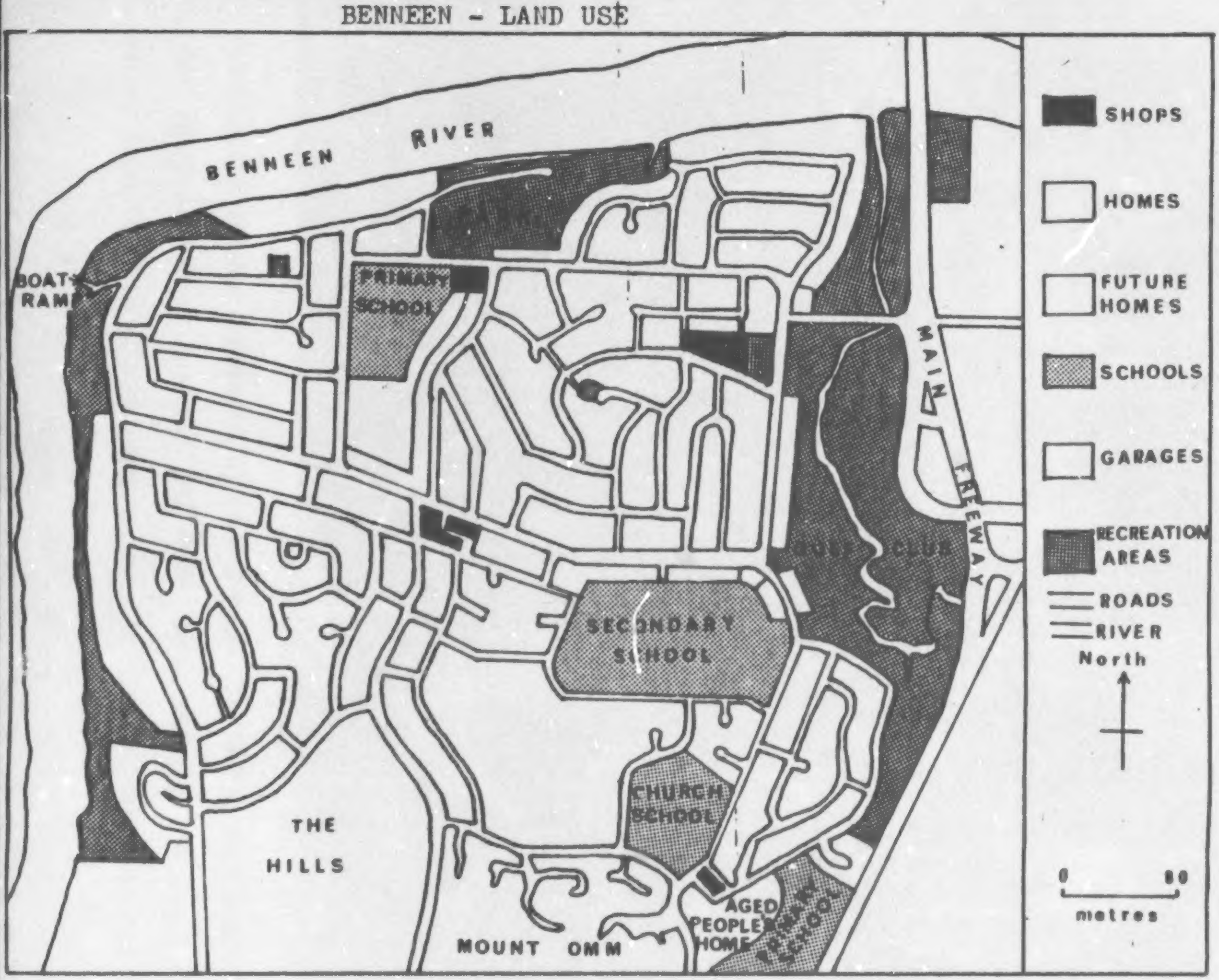
THE ROAD PATTERN FOR THE SUBURB DISCOURAGES FAST TRAFFIC MOVEMENT AND INCREASES SAFETY. THIS IS BECAUSE THE NETWORK OF ROADS, STREETS, CRESCENTS AND CUL DE SACS ELIMINATES CROSS-ROADS, AND HEAVY COMMUTER TRAFFIC BYPASSES THE ESTATE ALONG THE MAIN FREEWAY. THE SUBURB'S TWO SERVICE STATIONS(GARAGES) ARE LOCATED ON THE EASTERLY EDGE OF THE RESIDENTIAL AREA TO THE WEST OF THE RECREATIONAL AREA TO MAKE BEST USE OF VEHICLE TRAFFIC IN AND OUT OF BENNEEN.

BECAUSE THE RESIDENTS' IMMEDIATE NEEDS HAVE TO BE SERVED, IN EACH CORNER OF THE ESTATE, THERE IS A SHOPPING CENTRE. GROCERY SHOPS, HAIRDRESSERS, BUTCHERS, CHEMISTS ETC. OFFER A SMALL RANGE OF NECESSARY SERVICES WITHIN EASY DISTANCE OF MOST HOUSES.

SO THAT SCHOOLING IS CATERED FOR, THERE ARE FOUR SCHOOLS ON THE ESTATE. TWO PRIMARY SCHOOLS SERVE CHILDREN LIVING IN THE NORTH-WEST AND SOUTH-EAST AREAS. AS WELL, A CHURCH SCHOOL IS SITUATED NORTH-EAST OF MOUNT OMM, NOT FAR FROM ONE OF THE PRIMARY SCHOOLS. SINCED BENNEEN'S SCHOOL POPULATION IS VARIED IN AGE, A SECONDARY SCHOOL HAS BEEN BUILT JUST TO THE NORTH OF THE CHURCH SCHOOL IN A POSITION CENTRAL ENOUGH FOR SECONDARY AGE CHILDREN IN BENNEEN TO REACH EASILY. AN AGED PEOPLE'S HOME IS SITUATED TO THE EAST OF MOUNT OMM, BETWEEN A PRIMARY SCHOOL AND THE CHURCH SCHOOL. THE SITE PROVIDES A PLEASANT OUTLOOK TO THE WEST, AND IS SHELTERED BY MOUNT OMM. IT CATERS FOR THE ELDERLY RESIDENTS OF BENNEEN.

QUESTION: DRAW A MAP OF BENNEEN TO SHOW HOW THE AREA HAS BEEN DEVELOPED TO SERVE BEST THE PEOPLE WHO LIVE THERE.

Figure 3: VISUAL TRANSFORMATION TASK USING CAUSE-AND-EFFECT INFORMATION


BENNEEN - LAND USE
BENNEEN RIVER
BOAT RAMP
PRIMARY SCHOOL
SECONDARY SCHOOL
CHURCH SCHOOL
AGED PEOPLE'S HOME
PRIMARY SCHOOL
THE HILLS
MOUNT OMM
GOLF CLUB
MAIN FREEWAY
SHOPS
HOMES
FUTURE HOMES
SCHOOLS
GARAGES
RECREATION AREAS
ROADS
RIVER
North
0
80
metres

QUESTION: LOOK CLOSELY AT THE MAP OF BENNEEN. WRITE A STATEMENT TO SHOW WHY BENNEEN IS A GOOD SUBURB FOR YOUR FAMILY TO LIVE THERE.

Figure 4: VERBAL TRANSFORMATION TASK USING CAUSE-AND-EFFECT INFORMATION

THE HUNTING AREAS OF AN ESKIMO VILLAGE

AN ESKIMO VILLAGE IS SITUATED ON A RUGGED, SOUTH-EASTERLY COASTLINE. THERE ARE SEVERAL SMALL ISLANDS OFFSHORE. MANY SMALL, UN-NAVIGABLE STREAMS FLOW TO THE COAST.

THE CLIMATE IS SEVERE. EVEN IN SPRING, ICE EXTENDS 40 KILOMETRES (25 MILES) TO SEA, WHILE IN WINTER, THE ICE FLOE PROJECTS 70 KILOMETRES (45 MILES) TO SEA.

THE ESKIMOS' MAIN SOURCE OF FOOD IS SEA MAMMALS. SEALS AND WALRUS ARE HUNTED THROUGH HOLES IN THE ICE IN WINTER, AND BY BOAT IN SUMMER. SEALS ARE ALSO NETTED IN AUTUMN. ANOTHER MAMMAL, THE WHALE, IS HUNTED BY BOAT IN SUMMER AND IN LATE AUTUMN. HUNTING MAMMALS TAKES PLACE WITHIN A 200 KILOMETRE (125 MILE) RANGE FROM THE VILLAGE.

BIRD HUNTING AND EGG COLLECTING TAKE PLACE ALONG THE COAST SHORELINE AND IN AMONG ROCKS IN SUMMER. THEY ARE NETTED OR CAUGHT BY HAND. ALONG THE COAST, BIRDS ARE CAUGHT ON FISHING LINES.

DURING WINTER AND SPRING, CARIBOU ARE HUNTED OVER THE LAND AREA MAINLY TO THE NORTH AND WEST OF THE VILLAGE. HUNTERS MAY JOURNEY UP TO 150 KILOMETRES (90 MILES) FROM THE VILLAGE DURING THIS TIME. AS WELL, CARIBOU ARE HUNTED IN A SMALL COASTAL AREA 250 KILOMETRES (155 MILES) TO THE NORTH-EAST OF THE VILLAGE.

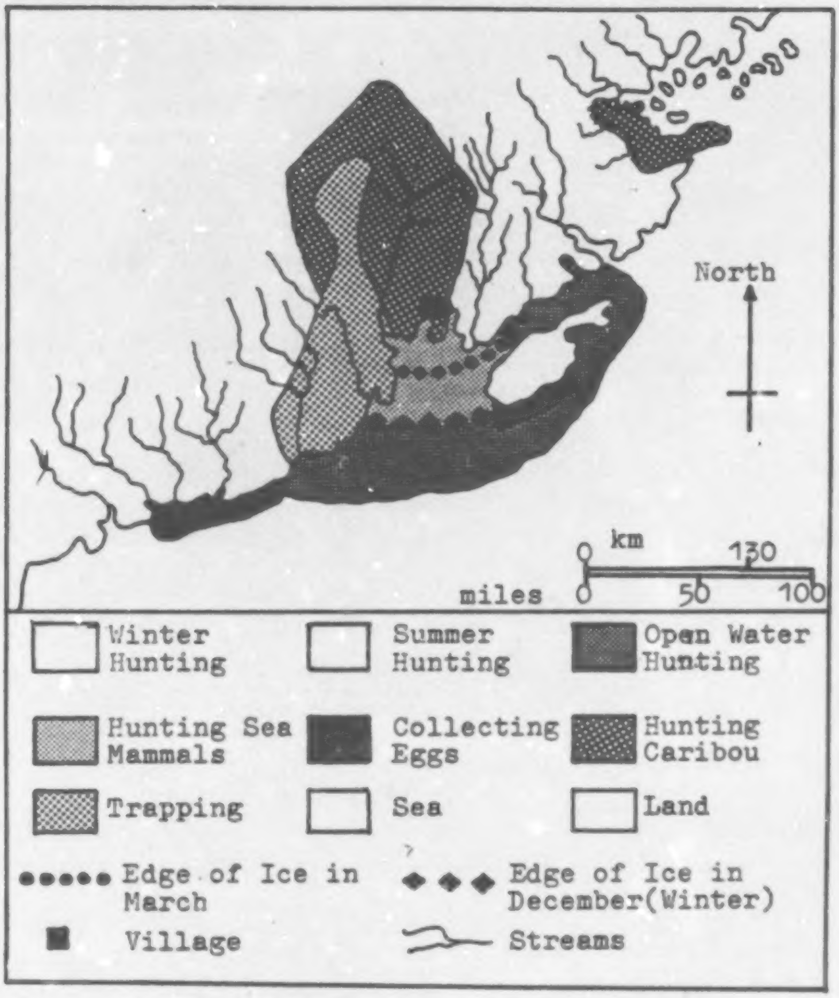
SMALL ANIMALS ARE TRAPPED INLAND FROM THE VILLAGE, UP TO 130 KILOMETRES (80 MILES) AWAY IN WINTER. IN ADDITION, LIMITED AMOUNTS OF FISH ARE CAUGHT NEAR THE ICE FLOE IN SUMMER AND AUTUMN.

THE ESKIMOS MOVE ON THE LAND AND THE SEA. IN SUMMER AND AUTUMN, A SINGLE OR DOUBLE KAYAK AND SOMETIMES LARGER BOATS ARE USED FOR SEA TRAVEL. OTHER THAN WALKING, LAND TRANSPORT, ESPECIALLY IN WINTER AND SPRING, IS BY SLED AND DOG TEAM.

QUESTION: DRAW A MAP TO SHOW THE EXTENT OF THE ESKIMOS' HUNTING AREAS THROUGHOUT THE YEAR.

Figure 5: VISUAL TRANSFORMATION TASK USING IMPLIED INFORMATION

THE HUNTING AREAS OF A TYPICAL ESKIMO VILLAGE


North
km
0
130
miles
0
50
100
Winter Hunting
Summer Hunting
Open Water Hunting
Hunting Sea Mammals
Collecting Eggs
Hunting Caribou
Trapping
Sea
Land
Edge of Ice in March
Edge of Ice in December(Winter)
Village
Streams

QUESTION:

WRITE A PASSAGE TO COMPARE THE HUNTING BY THE ESKIMOS IN WINTER AND IN SUMMER. YOU SHOULD ALSO INCLUDE SOME REASONS FOR THE SUMMER AND WINTER HUNTING PATTERNS.

Figure 6: VERBAL TRANSFORMATION TASK USING IMPLIED INFORMATION

reflected in the accuracy of statements of distance and the relative proportions of key features; the accurate use of the main signs on the map; the ability to emphasise the main or "figure" aspects of the map; and the conceptual integrity or overall comprehensiveness and accuracy of the written statement. Most of these criteria rely substantially on the students' ability to translate the message of the map successfully.

The criteria for the visual transformation task are designed to match those of the verbal transformation task. The criteria for the visual transformation task hinge around the students' ability to encode cartographic information. Consequently, the following criteria are used to evaluate the students' visual transformations: the accurate location of the ten main features on the map; the structural integrity of the key base features such as rivers, roads and clusters of buildings; the use of an accurate statement of direction; the understanding and use of proportion and scale as evidenced by depicting the relative proportion of key features accurately, an accurate representation of distance and a clear statement of scale; the ability to encode signs on a map as evidenced by an accurate encoding of the main features to be represented on the map and the sophistication of the signs; the ability to present a clear "figure" on the map; and the conceptual integrity or overall comprehensiveness and accuracy of the map.

Each of the above criteria was assessed on a five-point scale. The most accurate responses were scored 1 and the least accurate responses were scored 5. The students' scores for each criteria on a verbal and a visual transformation are totalled to produce verbal and visual transformation scores for each of the three levels of comprehension. The students' performances may then be compared on the basis of total transformation scores and individual criteria.

The results of this study are presented in two forms - statistical analyses of students' performance and descriptive examples of the students' transformations. The statistical analyses used in the study consist of the following:

1. Analysis of variance to detect significant differences between groups on the basis of Form and Sex.
2. Pearson correlations of the students' performances in verbal and visual transformations across the three levels of comprehension and
3. Analyses of each criteria to detect notable variations in criteria applied to verbal and visual transformations.

The analyses of variance between the groups on the basis of Form and Sex are presented in Tables 2 and 3 respectively. The students' actual mean scores are presented in Tables 5 and 6. The results in Table 2 indicate significant differences between the group mean scores of students in Form 1 and Form 3 on all of verbal transformation tasks and on the cause-and-effect and inferential tasks for visual transformation. However, the results in Table 3 indicate that there is insignificant variance of students' ability to visually and verbally transform geographical information by sex.

Table 2: ANALYSIS OF VARIANCE OF STUDENTS' ABILITY TO VISUALLY AND VERBALLY TRANSFORM GEOGRAPHICAL INFORMATION BY FORM

Variable	Degrees of Freedom	F Score	Significance of F
Verbal Transformation 1	1	5.22	.026*
Verbal Transformation 2	1	17.41	.000*
Verbal Transformation 3	1	19.52	.000*
Total Verbal Transformation	1	15.99	.000*
Visual Transformation 1	1	0.13	.722
Visual Transformation 2	1	6.97	.011*
Visual Transformation 3	1	22.42	.000*
Total Visual Transformation	1	1.85	.179

* Significant at 0.05 level.

Table 3: ANALYSIS OF VARIANCE OF STUDENTS' ABILITY TO VISUALLY AND VERBALLY TRANSFORM GEOGRAPHICAL INFORMATION BY SEX

Variable	Degrees of Freedom	F Score	Significance of F
Verbal Transformation 1	1	0.943	.336
Verbal Transformation 2	1	0.001	.970
Verbal Transformation 3	1	1.177	.283
Total Verbal Transformation	1	0.485	.489
Visual Transformation 1	1	0.014	.905
Visual Transformation 2	1	0.194	.662
Visual Transformation 3	1	0.366	.548
Total Visual Transformation	1	0.008	.930

* Significant at 0.05 level

The above results indicate substantial significant variations between Form 1 and Form 3 students on discrete and overall verbal transformations and discrete visual transformations. It is also worthwhile to compare each students' scores on matching verbal and visual transformations. Pearson correlations were computed to match students' verbal and visual transformation scores at each of the three ways of organising information and as a grand total score for all verbal and visual transformations. The results of the Pearson correlations are presented in Table 4. At the grand total level, the results indicate low correlation scores for Form 1, Form 3 and for the whole group in students' abilities to transform geographical information verbally and visually. For explicit information, the results indicate a low level of correlation for all students on their ability to transform geographical information verbally and visually. The correlation scores vary for the cause-and-effect organisation task. There is a very low correlation for students in Form 1 (.033) and a low level of correlation for the whole group (.376). However, there is a moderate correlation (.465) for students in Form 3 between their scores on verbal and visual transformations using geographical information. When data relating to the inferential task were analysed, the correlation scores for all students were low (.084, .066 and .194 respectively), indicating little correlation between students' scores on their verbal and visual transformations of geographical information.

An analysis of each criteria in each verbal and visual transformation was conducted to ascertain how students handled each aspect of the transformation and whether there was any evidence of development from Form 1 to Form 3. The results of these item analyses are presented in Tables 5 and 6. Table 5 refers to the students' verbal transformations and Table 6 refers to the students' visual transformations. The students' scores on their verbal transformations indicate that the criteria which the students are able to perform best are: accuracy in making statements of distance, the accurate use of the signs on a map, the use of directions to locate features and their understanding of the arrangement of features on the map. Additionally, the criteria which the students understand least in making verbal transformations are the conceptual integrity of the written statement and use of the relative proportions of key features. These generalisations are true for each of the three tasks derived from differently organised information.

There is considerable evidence of development from Form 1 to Form 3 in some criteria of verbal transformation. For the verbal transformation using explicit

Table 4: CORRELATIONS OF CHILDREN'S SCORES ON THEIR ABILITIES TO VISUALLY AND VERBALLY TRANSFORM GEOGRAPHIC INFORMATION

Correlated Variables	Correlated Scores
Verbal Transformation/Visual Transformation of Explicit Information	
. Whole Group	.248
. Form 1	.233
. Form 3	.214
Verbal Transformation/Visual Transformation of Cause-and-Effect Information	
. Whole Group	.376
. Form 1	.033
. Form 3	.465
Verbal Transformation/Visual Transformation of Implied Information	
. Whole Group	.194
. Form 1	.084
. Form 3	.066
Total Verbal Transformation/Total Visual Transformation	
. Whole Group	.237
. Form 1	.325
. Form 3	.311

information most development has occurred in the accuracy of the students statements of distance. However, there is evidence of development in all other criteria. Most development for the task using cause-and-effect information has occurred from Form 1 to Form 3 in the use of direction to locate features, the accurate use of the main signs on the map and the ability to emphasise the main or "figure" aspects of the map. There was also evidence of development in the students' understanding of the arrangement of features on the map, understanding of the structural integrity of the main features on the map, statement of the relative proportions of the key features and the conceptual integrity of the written statement. There was evidence of develop-

Table 5: CHILDREN'S ABILITY TO TRANSFORM GEOGRAPHIC INFORMATION VERBALLY - ITEM ANALYSIS

Variable	Marks	$\overline{X}$ Group	SD Group	Range Group	$\overline{X}$ Form 1	SD Form 1	Range Form 1	$\overline{X}$ Form 3	SD Form 3	Range Form 3
Verbal Transformation (1)										
Arrangement	5	2.93	0.71	2.0	3.10	0.71	2.0	2.77	0.68	2.0
Structural Integrity	5	3.18	0.87	3.0	3.33	0.8	3.0	3.03	0.93	3.0
Direction	5	2.67	0.65	3.0	2.83	0.59	2.0	2.5	0.68	3.0
Proportion	5	3.38	0.67	3.0	3.5	0.57	2.0	3.27	0.74	2.0
Distance	5	2.72	0.64	2.0	3.07	0.52	2.0	2.37	0.56	2.0
Legend	5	2.75	0.6	2.0	2.83	0.65	2.0	2.67	0.55	2.0
Figure - Ground	5	3.05	0.75	3.0	3.2	0.71	3.0	2.9	0.76	2.0
Conceptual Integrity	5	3.40	0.78	3.0	3.57	0.78	3.0	3.23	0.82	2.0
TOTAL	40	24.10	4.68	19.0	25.43	4.26	16.0	22.77	4.76	17.0
Verbal Transformation (2)										
Arrangement	5	3.33	0.63	3.0	3.53	0.57	2.0	3.13	0.63	2.0
Structural Integrity	5	3.83	0.59	3.0	4.07	0.52	2.0	3.6	0.56	2.0
Direction	5	3.18	0.65	2.0	3.53	0.51	1.0	2.83	0.59	2.0
Proportion	5	3.85	0.55	2.0	4.0	0.52	2.0	3.7	0.54	2.0
Distance	5	3.05	0.43	2.0	3.13	0.35	1.0	2.97	0.49	2.0
Legend	5	3.13	0.62	2.0	3.43	0.5	1.0	2.83	0.59	2.0
Figure - Ground	5	3.48	0.62	3.0	3.73	0.52	2.0	3.23	0.63	2.0
Conceptual Integrity	5	3.92	0.56	2.0	4.1	0.55	2.0	3.73	0.52	2.0
TOTAL	40	27.82	3.76	17.0	29.63	2.97	12.0	26.0	3.62	14.0
Verbal Transformation (3)										
Arrangement	5	3.67	0.60	3.0	3.9	0.48	2.0	3.43	0.63	2.0
Structural Integrity	5	4.17	0.59	2.0	4.4	0.49	1.0	3.93	0.58	2.0
Direction	5	3.43	0.67	2.0	3.57	0.5	1.0	3.3	0.79	2.0
Proportion	5	4.1	0.48	2.0	4.33	0.48	1.0	3.87	0.35	1.0
Distance	5	3.35	0.61	2.0	3.53	0.51	1.0	3.17	0.65	2.0
Legend	5	3.42	0.62	2.0	3.70	0.47	1.0	3.13	0.63	2.0
Figure - Ground	5	3.78	0.61	3.0	4.13	0.35	1.0	3.43	0.63	2.0
Conceptual Integrity	5	4.18	0.57	2.0	4.43	0.5	1.0	3.93	0.52	2.0
TOTAL	40	30.1	3.81	18.0	32.0	2.74	9.0	28.2	3.81	15.0
VERBAL TRANSFORMATION GRAND TOTAL	120	81.8	11.1	48.0	86.97	8.73	32.0	76.63	10.93	38.00

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Table 6: CHILDREN'S ABILITY TO TRANSFORM GEOGRAPHIC INFORMATION VISUALLY - ITEM ANALYSIS

Variable	Marks	$\bar{X}$ Group	SD Group	Range Group	$\bar{X}$ Form 1	SD Form 1	Range Form 1	$\bar{X}$ Form 3	SD Form 3	Range Form 3
Visual Transformation (1)										
Arrangement	5	3.0	0.82	4.0	3.2	0.93	3.0	2.8	0.66	3.0
Structural Integrity	5	3.07	0.92	4.0	3.2	1.03	3.0	2.93	0.78	3.0
Direction	5	3.38	0.52	2.0	3.37	0.49	1.0	3.4	0.56	2.0
Proportion	5	3.13	0.77	3.0	3.2	0.88	3.0	3.1	0.64	2.0
Distance	5	2.48	0.65	2.0	2.67	0.76	2.0	2.3	0.47	1.0
Scale	5	4.67	0.48	1.0	4.47	0.51	1.0	4.87	0.35	1.0
Legend	5	4.22	1.17	3.0	3.77	1.25	3.0	4.67	0.88	3.0
Sophistication of Signs	5	2.32	0.62	2.0	2.17	0.65	2.0	2.47	0.57	2.0
Figure - Ground	5	3.12	0.76	3.0	3.0	0.91	3.0	3.23	0.57	2.0
Conceptual Integrity	5	3.33	0.88	3.0	3.4	1.04	3.0	3.27	0.69	2.0
TOTAL	50	32.68	5.44	23.0	32.43	6.56	23.0	32.93	4.11	17.0
Visual Transformation (2)										
Arrangement	5	3.5	0.59	3.0	3.77	0.57	2.0	3.23	0.51	2.0
Structural Integrity	5	4.02	0.51	2.0	4.2	0.55	2.0	3.83	0.38	1.0
Direction	5	3.32	0.47	1.0	3.43	0.5	1.0	3.2	0.41	1.0
Proportion	5	3.92	0.49	2.0	4.13	0.43	2.0	3.7	0.47	1.0
Distance	5	2.88	0.49	2.0	3.07	0.45	2.0	2.7	0.47	1.0
Scale	5	5.00	0.0	0.0	5.0	0.0	0.0	5.0	0.0	0.0
Legend	5	4.8	0.61	2.0	4.67	0.76	2.0	4.93	0.37	2.0
Sophistication of Signs	5	2.77	0.56	3.0	2.83	0.46	2.0	2.7	0.65	3.0
Figure - Ground	5	3.45	0.56	2.0	3.4	0.62	2.0	3.5	0.51	1.0
Conceptual Integrity	5	3.95	0.62	2.0	4.1	0.71	2.0	3.8	0.48	2.0
TOTAL	50	37.6	3.07	14.0	38.6	3.01	13.0	36.6	2.85	10.0
Visual Transformation (3)										
Arrangement	5	3.75	0.51	3.0	3.63	0.62	3.0	3.87	0.35	1.0
Structural Integrity	5	4.0	0.61	2.0	3.87	0.78	2.0	4.13	0.35	1.0
Direction	5	3.47	0.5	1.0	3.43	0.5	1.0	3.5	0.51	1.0
Proportion	5	3.92	0.49	2.0	3.73	0.58	2.0	4.1	0.31	1.0
Distance	5	2.85	0.55	2.0	2.67	0.66	2.0	3.03	0.32	2.0
Scale	5	5.0	0.0	0.0	5.0	0.0	0.0	5.0	0.0	0.0
Legend	5	4.52	1.0	3.0	4.1	1.24	3.0	4.93	0.36	2.0
Sophistication of Signs	5	2.72	0.85	3.0	2.2	0.76	3.0	3.23	0.57	2.0
Figure - Ground	5	3.4	0.72	2.0	3.03	0.72	2.0	3.77	0.51	2.0
Conceptual Integrity	5	3.95	0.62	2.0	3.73	0.74	2.0	4.17	0.38	1.0
TOTAL	50	37.52	4.21	17.0	35.3	4.76	17.0	39.73	1.78	7.0
VISUAL TRANSFORMATION GRAND TOTAL	150	107.73	8.91	41.0	106.2	10.03	41.0	109.27	7.48	28.00

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ment from Form 1 to Form 3 on all criteria for the verbal transformation using implied information.

An examination of the students scores across the three different organisations of information indicates a general decrease in students' ability to transform geographical information verbally from the explicit information to the implied information for all criteria. Therefore, one may conclude that the three levels of information organisation are of increasing difficulty from the explicit level to the implied level and that students have displayed development in all criteria of verbal transformation of geographical information from Form 1 to Form 3.

The patterns of the students' scores on their visual transformations are not as definite. The criteria which the students understood best in their visual transformations are: an accurate representation of distances, the sophistication of encoded signs used on the maps, the accurate location of the main features on the maps, and the ability to present a clear "figure" on the map. Also, the criteria which the students expressed most poorly in their maps were: a clear statement of scale, the use of a clear legend, and the structural integrity of key base features such as roads, rivers and clusters of buildings.

The evidence of development from Form 1 to Form 3 which was noticeable in the students' verbal transformations was not as noticeable in their visual transformations. In fact, for the explicit and cause-and-effect information, students in Form 1 outscored students in Form 3 in most criteria. The only exceptions were in scale and in the figure - ground relationship. This pattern may have occurred because the students in Form 1 had more ability in drawing maps. Alternatively, it may have occurred because there is no substantial difference in the abilities of adolescents to make visual transformations. However, for the implied information there is evidence of considerable development from Form 1 to Form 3 in students' ability to make visual transformations of geographical information. Most development occurred in the use of a clear legend, the sophistication of the signs included in the legend and in the establishment of a figure - ground relationship. Development was also noted in the students' understanding of: the conceptual integrity of the maps, the accurate representation of distances, the depiction of relatively accurate proportions of key features, the structural integrity of the key base features on the maps, the arrangement of these key features and accuracy of directions on the maps.

An examination of the students' scores across the three forms of information for their visual transformations did not reveal the same consistent decrease in ability across the three forms as occurred in the students' verbal transformations. Students in Form 1 found the visual transformation using the cause-and-effect information the most difficult task, with transformation using explicit information as the easiest task. Students in Form 3 exhibited a general decrease in ability to make visual transformations using explicit information to making these transformations using implied information. Overall, the students found that visual transformations using explicit information are the easiest type of visual transformation and that similar difficulties were experienced using cause-and-effect and implied forms of information.

The above results may be illustrated by referring to representative samples of the students' transformations. The students' verbal transformations using explicit information are represented in Figures 7 and 8. Not only is the example from Form 3 more comprehensive than for the Form 1 example, but it generally displays greater understanding of most of the above-mentioned criteria for verbal transformation of geographical information. For example, directions used are more accurate, as are statements of distance. As well, the Form 3 example contains a clearer understanding of the structure of the area.

> *The houses are east from Logan river. Next to the houses are hayshed/barn. Next to the barns are machinery sheds. Near to the machinery shed is the dairy. The water tanks and trees are all spread apart. The animal nursery is on the east of the houses. There are fences surrounding most parts of the farm. The Walkers Road leads to all the houses and barns etc. The Walkers Road also leads to the main road. The railway crosses over the Walkers Road. The irrigated fields spread all over the farm. The irrigated pipes lead through the fields. The other farm land is where all the animals go to run about.*

Figure 7: A FORM 1 VERBAL TRANSFORMATION USING EXPLICIT INFORMATION

> *The railway starts just in from the south-east corner and runs in a N.N.W. direction. Half way up the railway a minor road runs under it horizontally for about 1125 metres. At the right end of the minor road, runs the main road in a slight leftward slant. The minor road is called Walker's Road, and the main road is called Mt Lindesay Freeway. Under Walker's Raod, on the left of the railway there are four irrigated fields. The largest one being nearest the railway, two along side one another nearest the road. Underneath them runs an irrigation pipe which runs three quarters of the way through the large one. Underneath the pipe is the fourth field, and underneath that field are some houses. S.W. of the fourth field there's a swamp which runs south. The irrigation pipe under the joint fields runs S.W. for about 250 m, then runs west for about 625 m. Underneath this part of the pipe there are three more fields. There's a large one on the left, the centre one is about three quarters the size of the first, and the one on the right is about half the size of the second.*

Figure 8: A FORM 3 VERBAL TRANSFORMATION USING EXPLICIT INFORMATION

The two samples of visual transformation using explicit information (Figures 9 and 10) represent the work of the more able students in Forms 1 and 3. These two samples illustrate the similar abilities of both groups of students to transform geographic information visually using explicit information. The main difference between the two samples is the increased abstraction of the signs on the map of the Form 3 student.

Using the cause-and-effect information, the students' samples of verbal and visual transformations maintained the pattern of definite development in the students' ability to make verbal transformations from Form 1 to Form 3 (see Figures 11 and 12). There is a noticeable difference in the quality of the Form 1 student's response compared to the response using explicit information, with the response using the cause-and-effect information being inferior in terms of the use of direction, the arrangement of the main features, the structural integrity of the area and the appreciation of a figure - ground relationship. Again, the Form 3 transformation sample is more comprehensive than the Form 1 sample. However, compared to the Form 3 verbal transformation using the cause-and-effect information there are less accurate statements

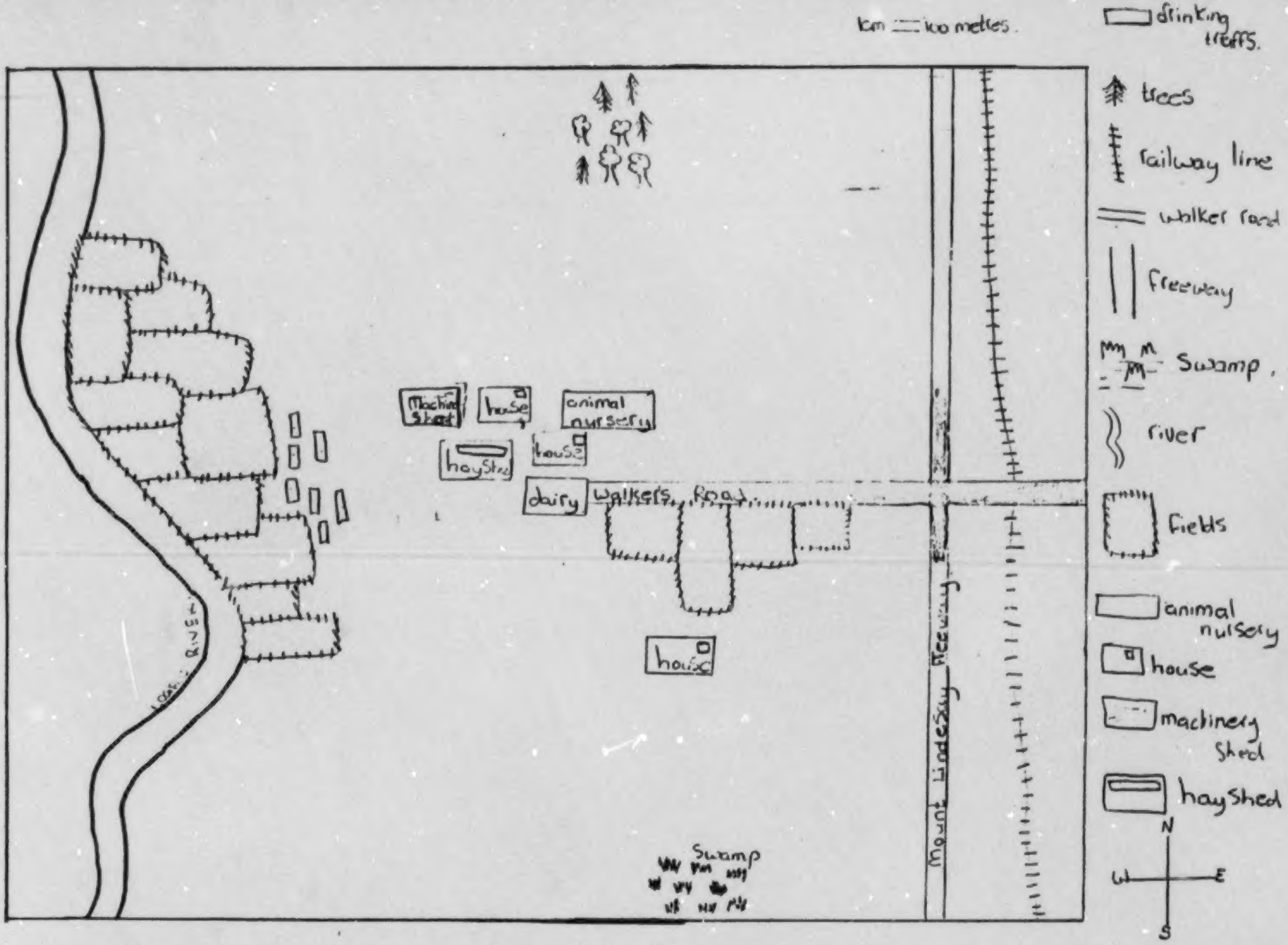
1cm == 100 metres.
drinking troffs.
trees
railway line
walker road
freeway
swamp.
river
fields
animal nursery
house
machinery shed
hay shed
N
W
E
S
Machine Shed
house
animal nursery
house
hay Shed
dairy
walkers Road
house
Mount Lindesay freeway
Swamp
Logan River

Figure 9: A FORM 1 VISUAL TRANSFORMATION USING EXPLICIT INFORMATION

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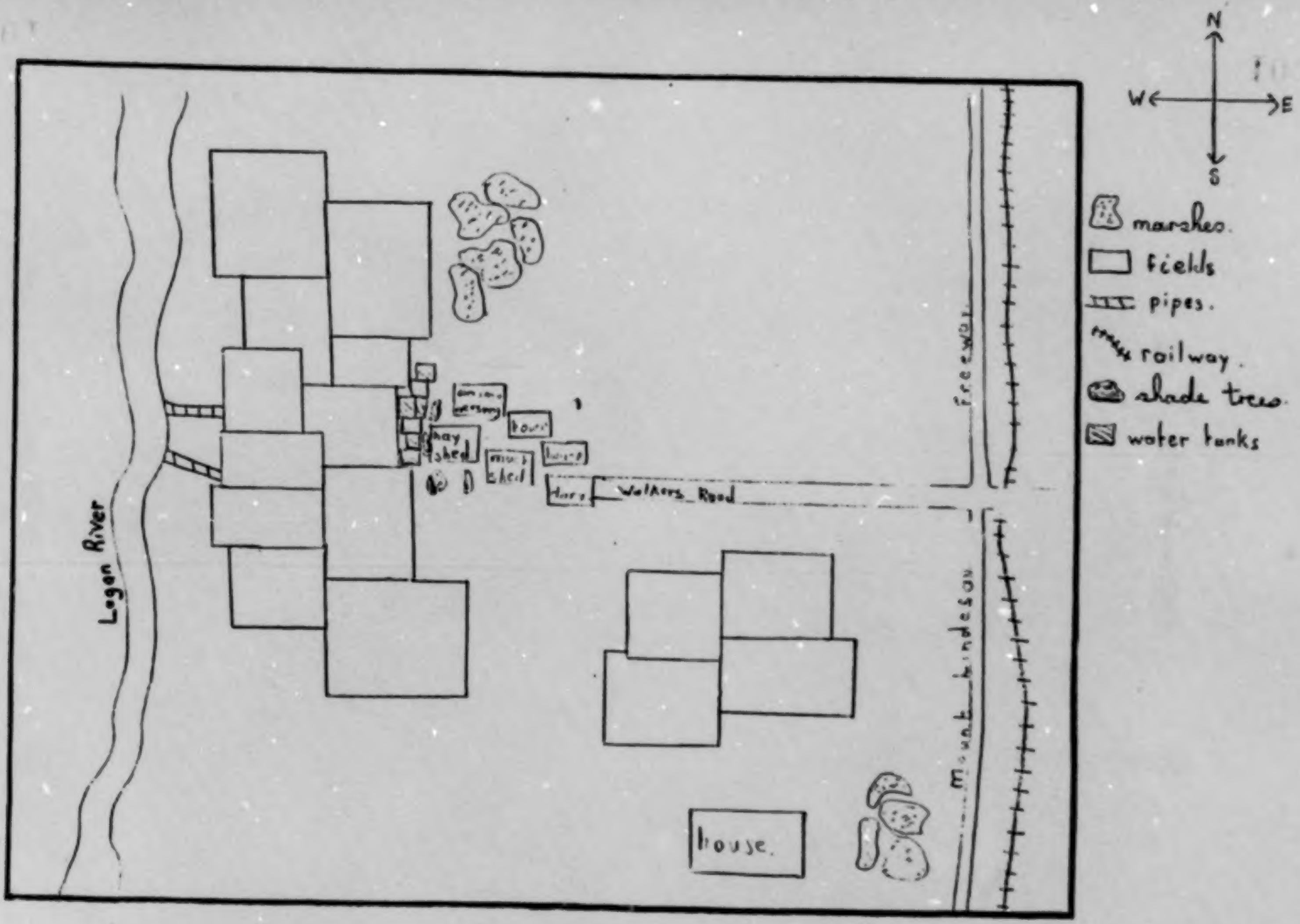
N
S
W
E
marshes.
fields
pipes.
railway.
shade trees.
water tanks
Logan River
hay shed
house
house
milk shed
Walkers Road
freeway
Mount Lindesay
house.

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Figure 10: A FORM 3 VISUAL TRANSFORMATION USING EXPLICIT INFORMATION

concerning direction, distance, the conceptual integrity of the statement and the arrangement of the key features in the Beneen area.

I think Benneen is a good place to live for a family because there is a good selection of schools in the city. There is a freeway which is easy reachable so you can go to the big cities. There is a whole range of leisure areas. There are plenty of homes for families. There is a lot of green space just outside the city.
The roads are very twisty so that the traffic stays slow.
There's a river nearby where people can go boating on it.
There are not many shops.

Figure 11: A FORM 1 VERBAL TRANSFORMATION USING CAUSE-AND-EFFECT INFORMATION

Benneen is a good suburb for a family to live because of the main attractions there. The Benneen River is situated on the west hand and north hand side of the estate, because the river is there the people can go on boat rides or fishing, swimming or even a boat holiday. There is a park which is to the north of the estate and goes just by the river; so if its hot you can sunbath on the park then go for a swim. There is a primary school on the north-east side of the estate and a primary school situated to the south-east near an old people's home and near the church school. The golf club is next to the main freeway and a secondary school on the north-east with a stream running through it. There are hills to the south-west where you can try a bit of climbing and the shops are to the north-west while a garage is to the north-east.

Figure 12: A FORM 3 VERBAL TRANSFORMATION AT THE CAUSE-AND-EFFECT LEVEL

The students' visual transformations using cause-and-effect information (Figures 13 and 14) are not as accurate as their visual transformations using explicit information, especially in relation to the arrangement of key features.

The students' responses using the implied information reflect the difficulty

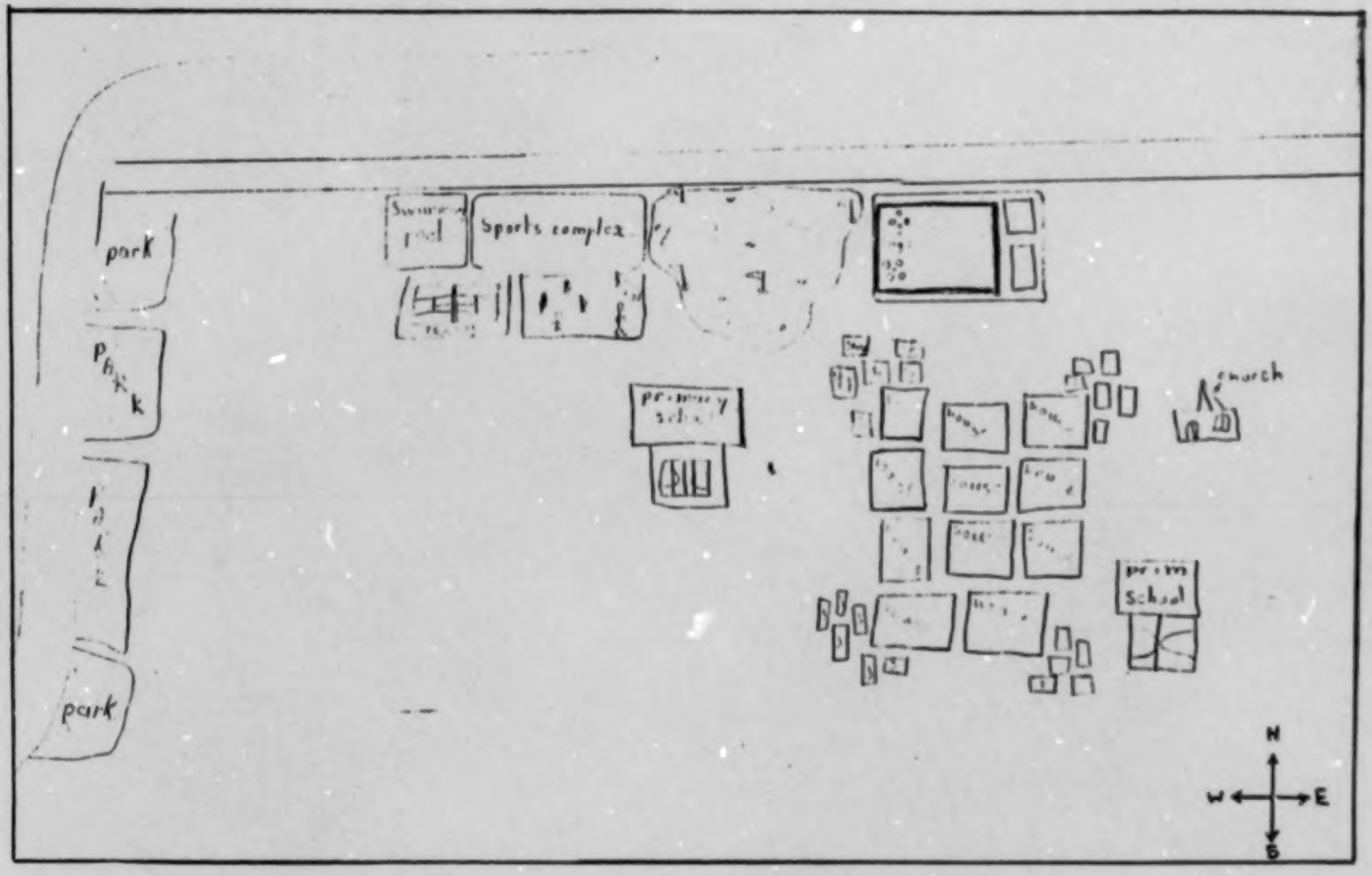
Swimming pool
Sports complex
park
Park
Park
park
primary school
church
prim School
house
N
W
E
S

Figure 13: A FORM 1 VISUAL TRANSFORMATION USING CAUSE-AND-EFFECT INFORMATION

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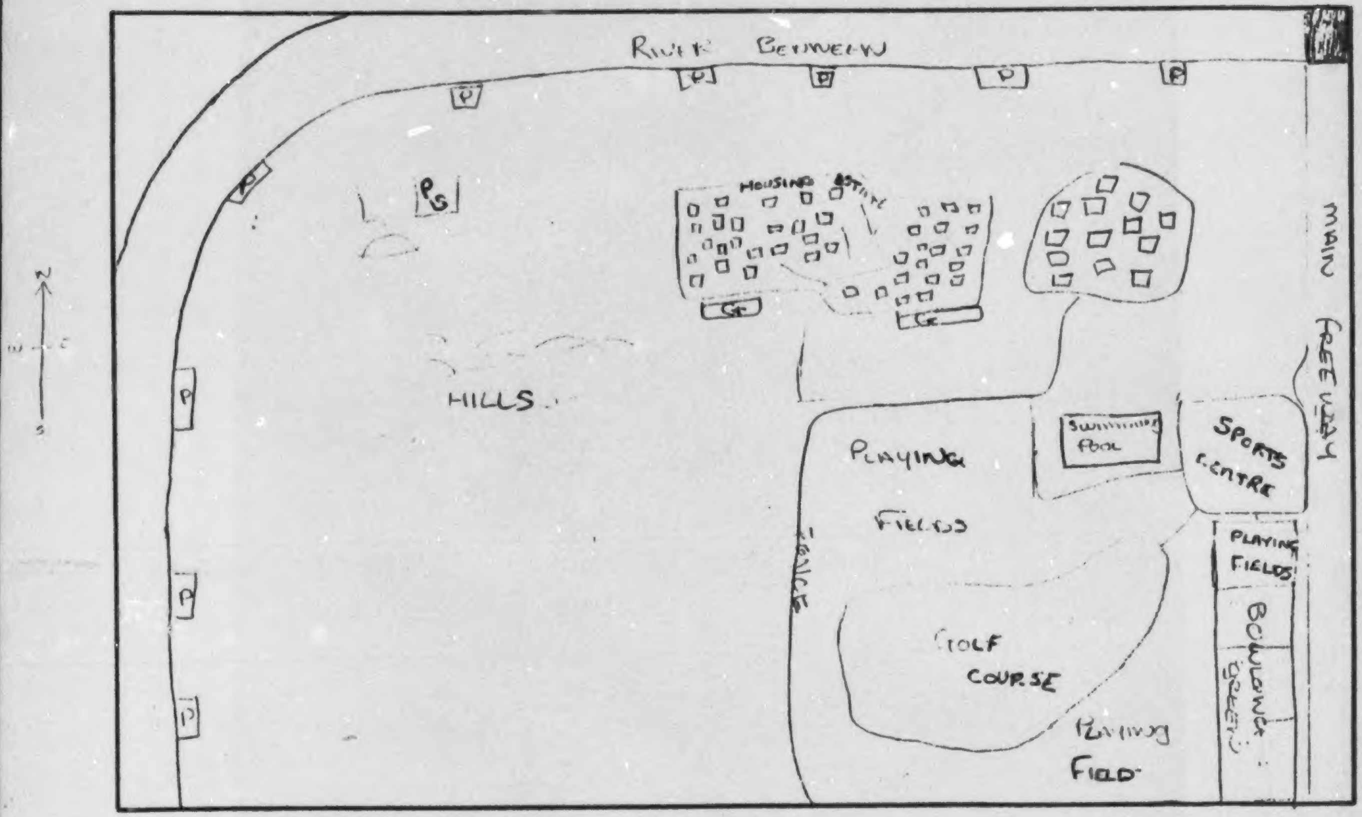

N
E
S
RIVER BENWELW
P
P
P
P
P
P
PS
HOUSING ESTATE
G
G
HILLS
MAIN FREEWAY
PLAYING FIELDS
SWIMMING POOL
SPORTS CENTRE
PLAYING FIELDS
FENCE
GOLF COURSE
BOWLING GREEN
PLAYING FIELD
P
P
P

Figure 14: A FORM 3 VISUAL TRANSFORMATION USING CAUSE-AND-EFFECT INFORMATION

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of both verbal and visual transformations using this form of information. This difficulty was most pronounced for Form 1 students for their verbal transformation (see Figure 15). Form 1 students made verbal transformations which were superficial. These written statements made limited use of almost all of the specific criteria and reflected the problem younger students have with more abstract geographical information.

Winter Hunters
The Eskimos in winter go hunting sea mammals so they can get their food. They also go trapping and hunting caribou. They cannot go fishing in winter because the water is all frozen up like ice.

Summer Hunting
In summer Eskimos go open water hunting, in other words, fishing in the middle of the water. They go and collect eggs and hunt sea mammals (diving).

Figure 15: A FORM 1 VERBAL TRANSFORMATION USING IMPLIED INFORMATION

The Hunting Areas of a Typical Eskimo Village
In the winter the Eskimos hunt mostly around their village by trapping the animals. They also hunt mammals and things like that. The ice in March is very small, because of the warm weather. They have quite a lot of ice during December because of the winter. During the summer the Eskimos go collecting eggs. The village is surrounded by streams, and during the winter they are frozen over. This time of year when the ice is frozen you can walk across the streams.
During the summer the men are able to hunt more freely because the animals start having their young and are not able to run as fast as usual. The men go collecting the birds' eggs around the coast of the land. There is a lot of sea around the land. They go open water hunting around the land because of the sea arount it. Apart from being streams in the village there are more around it.

Figure 16: A FORM 3 VERBAL TRANSFORMATION USING IMPLIED INFORMATION

Comparable verbal transformations by Form 3 students, as typified by the example in Figure 16, are definitely more sophisticated that the Form 1 example. The written statements make similar use of direction as for the other forms of information. However, the Form 3 students are less able to use scale, structural and conceptual integrity and the arrangement of the key features using implied information.

Samples of the students' visual transformations are illustrated in Figures 17 and 18. It is when they use implied information that the differences between the students' visual transformations are most evident. Form 1 students (see Figure 17) presented limited information in both abstract and pictorial forms. Legends were used on some maps, but statements of scale and direction were absent. Form 3 students (see Figure 18) presented more abstract information. They incorporated the concept of seasonality in their maps. Although statements of scale were absent, Form 3 students made use of a direction indicator. It should be noted that the visual transformations using implied information were inferior for both Form 1 and Form 3 students compared to the other visual transformations.

CONCLUSIONS

The above results indicate that British students aged twelve to fourteen years do not exhibit similar abilities to complete verbal and visual transformations of the same geographical information. In fact, the low correlations between the students' scores on their verbal and visual transformations suggests that geography teachers of these students could not expect them to make equatable verbal and visual transformations of similar geographical data. The significant differences between the students in Form 1 and Form 3 on all aspects of verbal transformation and when they used cause-and-effect and implied information for visual transformations suggest there is some development in students' ability to make verbal and visual transformation across the early secondary years.

As well, these students displayed differing strengths and weaknesses in making verbal and visual transformations, as displayed by their ability to understand the range of discrete criteria. While direction, distance, legend and arrangement were the criteria best handled in verbal transformations, distance, sophistication of signs, arrangement and figure - ground relationship were the criteria best handled in the visual transformations. This pattern seems so for all students and could provide geography teachers with clues on the criteria to stress in verbal and visual transformations respectively. Conversely, the

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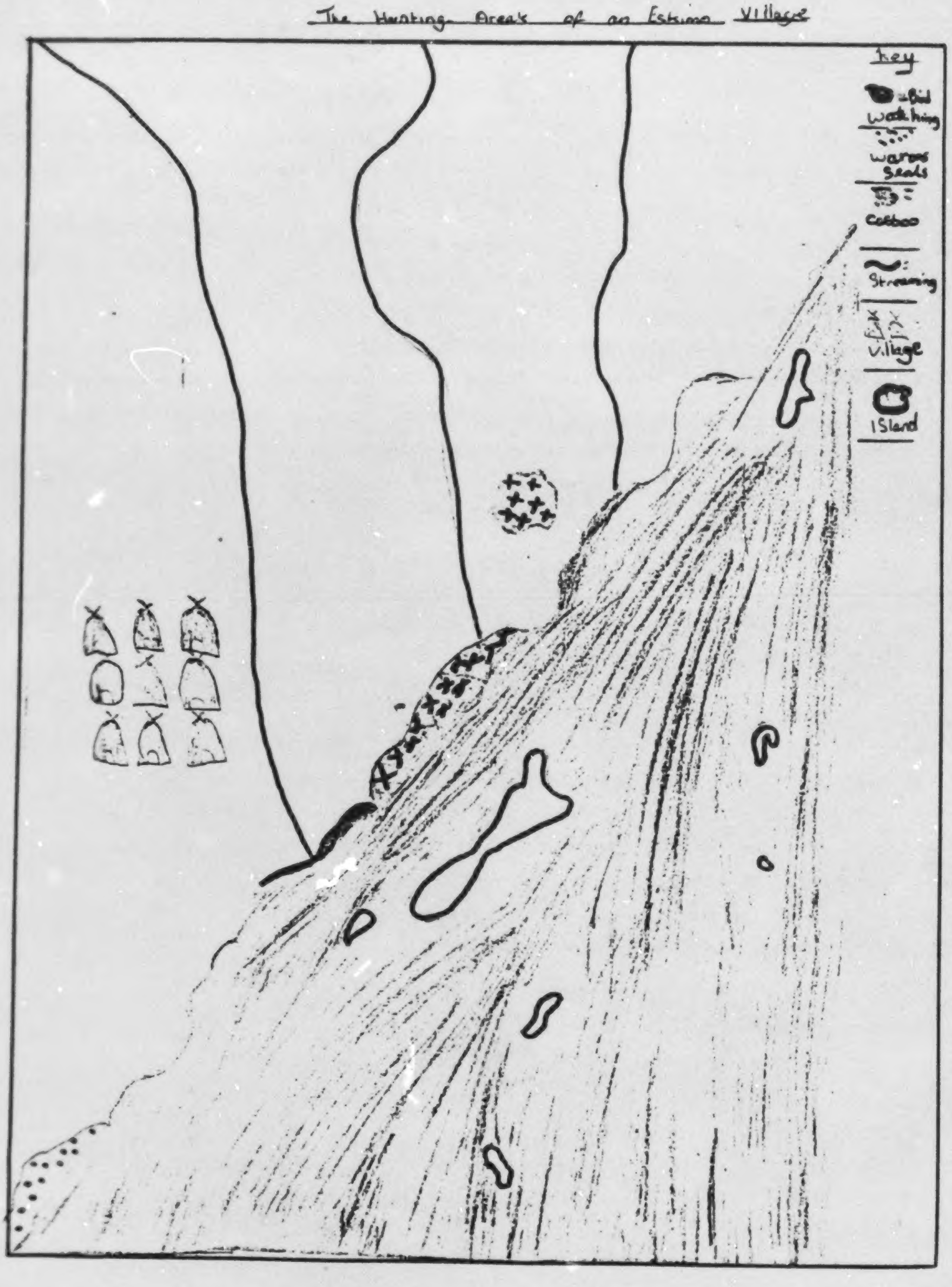
The Hunting Area's of an Eskimo Village
key
=Bird Watching
Walrus Seals
=
Cariboo
=
Streaming
Village
Island

Figure 17: A FORM 1 VISUAL TRANSFORMATION USING IMPLIED INFORMATION

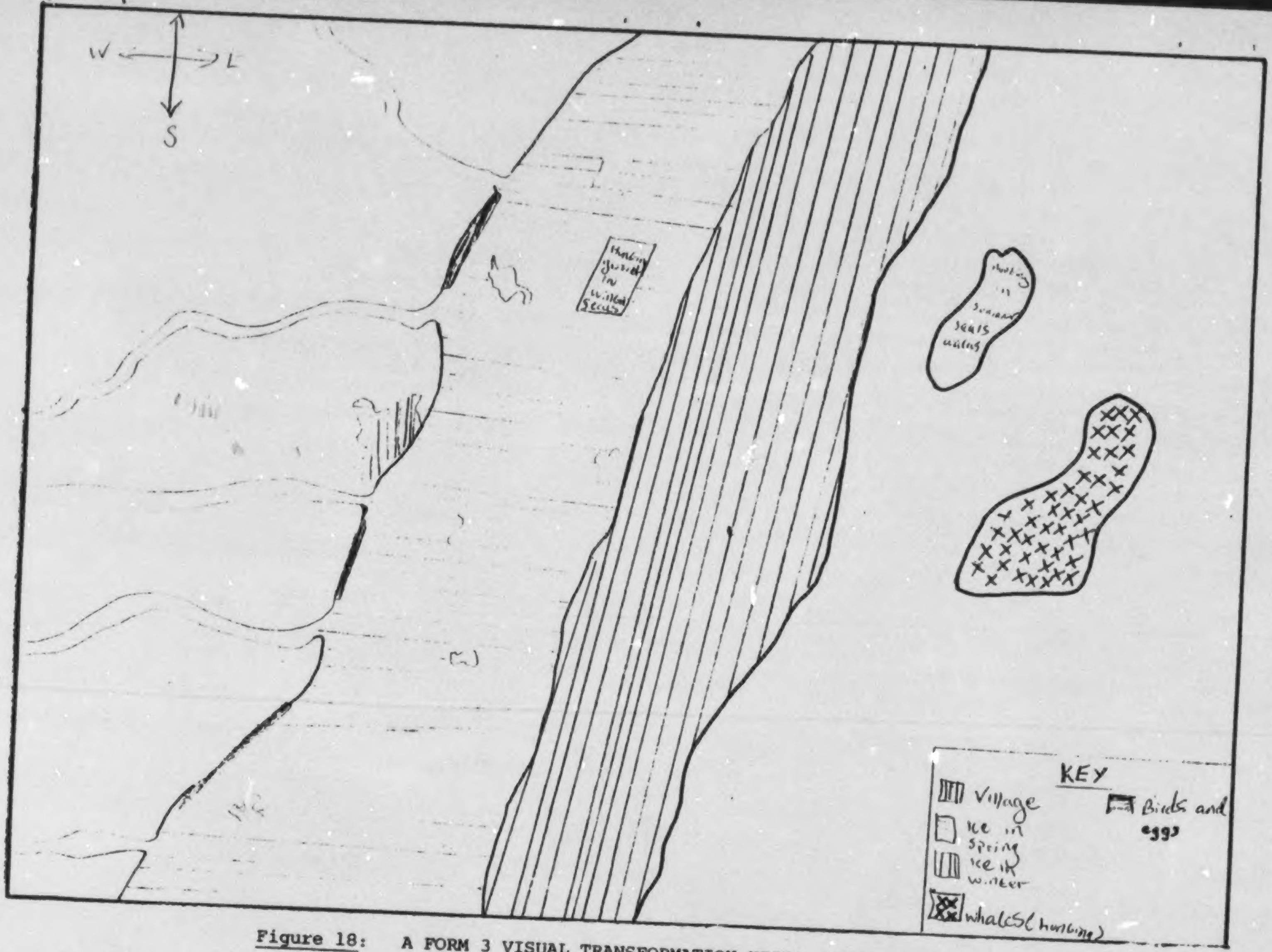
W
E
S
Hunting ground in winter seals
hunting in summer seals walrus
KEY
Village
Ice in spring
Ice in winter
whales (hunting)
Birds and eggs

Figure 18: A FORM 3 VISUAL TRANSFORMATION USING IMPLIED INFORMATION

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criteria which were handled poorly could provide geography teachers with ideas on those aspects of processing geographical information which need to be developed through learning.

This study has been an initial attempt to determine whether differences do occur in students' abilities to make verbal and visual transformations of geographical print information. There seems to be sufficient evidence to say that further detailed studies should be conducted to establish how Australian students perform on verbal and visual transformations of geographical information. As well, there is a need to investigate the processes by which students make such transformations. Some insights into these processes may assist geography teachers to devise more efficient strategies for promoting learning in geography. Once this has been done, there is the prospect of investigating other kinds of transformation of information which are common in geography classrooms. Oral, numerical and other kinds of graphic transformation come to mind as possibilities for investigation. Overall, it does seem that understanding students' transformations of information may lead to the development of learning experiences better suited to the cognitive abilities of geography students.

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CHILDREN TALKING TO LEARN

Michael Williams*

Abstract

Considerable recent research has been conducted into the use of language in classrooms. Unfortunately, few of these findings have been presented to teachers in a form that can be applied in their classrooms. This paper focuses on: pupils' and teachers' talking in geography classrooms; the social and cognitive functions of conversation in the classroom interactions; and alternative roles for talking in geography classrooms. The concept of pupil-pupil tutoring is raised as a potentially effective alternate strategy for promoting oral communication. This leads to the call for more research into the monitoring and evaluation of strategies for group organisation in geography classrooms.

For as long as we have had classrooms teachers have observed with varying degrees of curiosity children's behaviour, and so have children observed their teachers. Recent decades have witnessed increasing visits by academic strangers to classrooms to observe teachers and children, sometimes separately, sometimes in interaction. The motives of these strangers vary from person to person. Some are sociologists engaged in micro-social studies, others are social psychologists, others are educational psychologists and others are curriculum specialists. Without doubt classroom spoken language has become one of the principal foci of enquiry. Oral language is an accessible source of data, and data which can be transported from the classroom to other places for description and analysis. It is possible to consider the oral exchanges of pupils with their peers as the possession of those pupils, and the same is true for teachers with their pupils. This possession is removed by researchers, used for the researchers' purposes and then ..... what?

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In this paper I wish to argue that language researchers who use classrooms as their bases for inquiry and the sources for their data have a responsbility to present some of their findings in ways which are understood by teachers and which can be seen by them to be useful in their day to day work as teachers. Implicit in such an argument is the hypothesis that despite the considerable attention given by researchers to classroom language and behaviour, there appears to be little evidence in many classrooms of any dramatic changes in classroom behaviour. Is this because the research findings are inconclusive or unconvincing? Or is it because the findings are presented in a language which teachers cannot understand or in publications which teachers do not read? Or could it be that the information contained in studies of classrooms has been read but has not become 'action knowledge'? The argument can be pursued by applying some of these questions to the part played by pupil talk in learning in classrooms.

Classroom researchers are guilty of neglecting the subject context of school classrooms. It is interesting to read thorough, scholarly reviews of classroom research by Donald McIntyre, Tony Edwards, Martyn Hammersley and David Hargreaves in the Winter 1980 issue of 'Educational Analysis' (titled Classroom Studies and edited by David Hargreaves) from the point of view of the teacher educator or teacher. Is it naive to assume that classroom studies will yield guidance to classroom teachers as to ways of changing and improving their performance? For teachers who perceive their teacher identity through the eyes of the subject specialist this recent collection of reviews can offer only questions. Thus Tony Edwards (1980) refers to the work of Hymes (1977 and 1979) in socio-linguistics and his 'association of particular spheres of interaction with appropriate ways of speaking'. He writes, "The speakers' sense of identity and perception of the situation is expressed in the act of speaking. If belonging to any group brings constraints to 'talk like one of us', it also bring opportunities to display or deny membership through using the relevant esoteric forms of speech". Edwards goes on to write:

> The academic identitites of teachers and pupils are often displayed in this way. Learning a subject involves learning its 'language', and special items of vocabulary often serve to mark the boundaries of academic territories (Barnes et al. 1971, Edwards 1978, Richards 1978). This general point must be made speculatively because there has been so little recording of the actual words exchanged in classrooms that we continue to know remarkably little about variations in the forms and functions of instructional talk. For example, do some subjects make especially heavy linguistic demands? How do teachers 'mediate' between the everyday language of their pupils

> and the language they consider proper and necessary to their subject? How far do they modify the subject specific wording of their exposition or its level of abstraction when teaching younger or less able pupils, or when switching from lecture to discussion? Is pupils' own use of subject-language a measure of their socialization into the particular academic sub-culture? These are all questions for which very little information is available. (Edwards, 1980, 33)

We can ask, is this lack of information a product of the lack of interest of classroom teachers or a lack of interest among social scientists in classroom teaching and learning, as opposed to classroom interaction? Possibly, it reflects the difficulties experienced by teachers, pupils and researchers in articulating the meaning of the classroom subjects. Thus a subject teacher, when asked to give meaning to the subject content of a particular lesson or to small episodes in that lesson, may well experience difficulty in giving a coherent response. Exhortations to teachers to innovate in their classroom practices by, for example, providing more opportunities for pupil-pupil talk, pose the question about meaning in a particularly blunt way.

In the Bullock Report (DES, 1975) we read:

> In general a curriculum subject, philosophically speaking, is a distinctive mode of analysis. While many teachers recognise that their aim is to initiate a student in a particular mode of analysis, they rarely recognise the linguistic implications of doing so. They do not recognise, in short, that the mental processes they seek to foster are the outcome of a development that originates in speech. A person's impulse to talk over a problem that his thinking has failed to solve is a natural one; what he is doing is to regress to an earlier, simpler form of problem-solving situation. (p. 189)

The authors of the Bullock Report go on to argue that far more status should be given to pupil talk - exploratory and expressive - and state that "For such talk to flourish, the context must be as informal and relaxed as possible, and this is most likely to occur in small groups and in a well organised and controlled classroom".

Douglas Barnes (1976) used the term 'exploratory talk' as an organising concept and this extends the Bullock notion of 'talking over a problem'. For Barnes 'exploratory talk' is 'the groping towards a meaning which is usually marked by frequent hesitations, rephrasings, false starts and changes of direction' and he goes on to argue that such talk is one means by which the assimilation and accommodation of new knowledge to old is carried out. He writes, "The more a learner controls his own learning strategies and the more he is enabled to think aloud, the more he can take responsibility for formulating hypotheses and evaluating them" (p. 28). Let's turn to the recorded example of such talk included in the Appendix. The context is a small sixth form group in which the ten pupils are seated round a large table discussing world energy problems with their teacher.

In a general way we can identify in this short extract pupils engaged in formulating hypotheses, making assertions, expressing value judgements and introducing evidence derived from school lessons and extra-school sources, e.g. a TV programme. A more precise mode of analysis is offered by Barnes and Todd (1977) (see Table 1). Before considering the need for such analysis it is worth reflecting on the observations made by the authors of 'Writing Across the Curriculum' (Schools Council, 1976).

It might be argued that in any sixth form we could find students who

> had a real understanding and knowledge and yet had hardly ever 'chewed over' ideas in this way with other people in the course of their work. The answer would seem to be not that the chewing-over process has not occurred but that it has occurred internally; in other words the students have been thinking. But if we consider that very large numbers of pupils for whom most of school knowledge never really becomes part of their view of the world but instead withers and dies, the reason may indeed be that the process has not occurred - not in any form. We might have more success with such children if we deliberately made provision for this thinking, chewing-over part of learning to go on openly: which is to say, in language. (p. 14)

In this final sentence we find a policy statement - the deliberately created provision for open chewing over, for pupil talk - exploratory and expressive. We can translate the stages in implementing such a policy into a series of diagrams (Figure 1).

In Stage A we can see the pupils as a class group and the oral interaction between teacher and pupils (shown by the arrows) as originating predominantly from the teacher. With regard to learning (shwon in Stage A(ii)) we can see that the teacher communicates something to be learned, or facilitates learning by the pupils. The broken line indicates the strength of the communication from teacher (T) to pupil as learner (L). The dotted lines have been added to indicate that both pupil and teacher learn. Indeed, in some circumstances, (probably most?) the teacher learns more in

Table 1 SOCIAL AND COGNITIVE FUNCTIONS OF CONVERSATION

LEVEL ONE

(i) Discourse Moves

(a) Initiating	(b) Extending	(c) Eliciting	(d) Responding
	Qualifying	- Continue Expand Bring in	Accepting
	Contradicting	Support Information	

(ii) Logical Process

- (a) Proposes a cause
- (b) Proposes a result
- (c) Expands loosely (e.g. descriptive details)
- (d) Applies a principle to a case
- (e) Categorises
- (f) States conditions under which statement is valid or invalid
- (g) Advances evidence
- (h) Negates
- (i) Evaluates
- (j) Puts alternative view
- (k) Suggests a method
- (l) Restates in different terms

LEVEL TWO

(iii) Social Skills

(a) Progress through task	Given questions Shifting topic Ending a discussion Managing manipulator tasks
(b) Competition and conflict	Competition for the floor Contradiction Joking Compelling participation
(c) Supportive behaviour	Explicit agreement Naming Reference back Explicit approval of others Expression of shared feeling

(iv) Cognitive Strategies

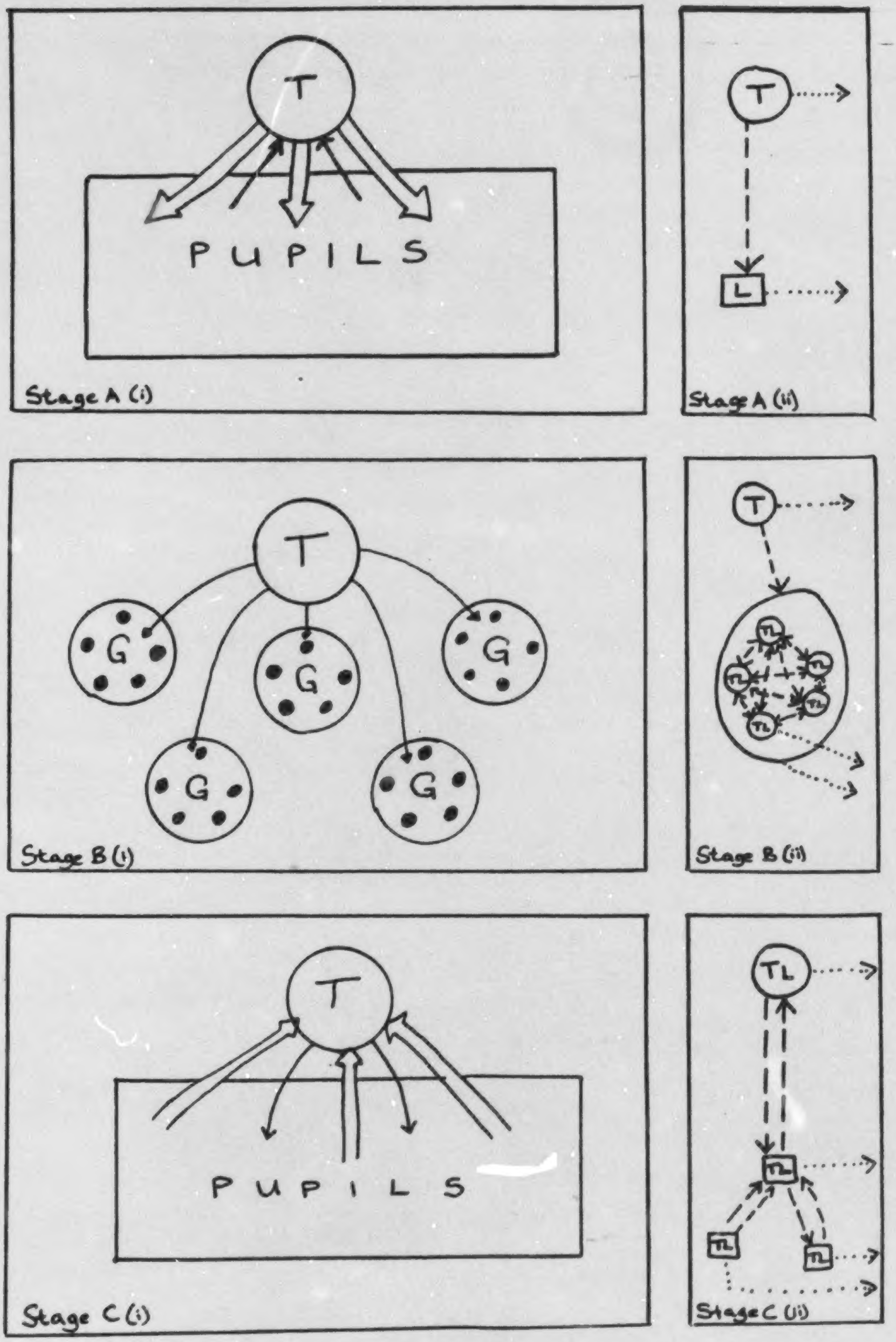
1 Constructing the question	'Closed' tasks Open tasks
2 Raising new questions	
3 Setting up hypotheses	Beyond the given Explicit hypotheses
4 Using evidence	Anecdote Hypothetical cases Using every-day knowledge Challenging generalities
5 Expressing feelings and recreating experience	Expressing ethical judgements Shared recreation of literary experience

(v) Reflexivity

(a) Monitoring own speech and throught	own contributions provisional
(b) Interrelating alternative viewpoints	validity to others more than one possibility finding overarching principles
(c) Evaluating own and others' performance	
(d) Awareness of strategies	audience for recording summarising moving to new topic

Source: Barnes, D. and Todd, F.,
Communication and Learning in Small Groups,
Routledge and Kegan Paul, 1977,
pp. 20-21.

Figure 1 THE TRANSITION FROM CLASS TO GROUPS AND BACK AGAIN.


T
PUPILS
Stage A (i)
T
L
Stage A (ii)
T
G
G
G
G
G
Stage B (i)
T
TL
Stage B (ii)
T
PUPILS
Stage C (i)
TL
TL
TL
TL
Stage C (ii)

interaction than the pupil - whether this be in substantive or in non-substantive terms. Thus it is as usual to find teachers stating that the best way to learn a subject is to teach it as it is to find student teachers complaining that they always over-prepare their lessons. In both cases the teachers are learning in excess of what is needed or capable of being learned by the pupils.

From Stage A to Stage B the teacher and pupils must cross a threshold. Structurally and environmentally the transition may be viewed simply as a change from a whole-class situation to a small group situation. Barnes (1976, p. 197) offers practical advice to teachers on a strategy for creating such groups. He uses five headings: feeling of competence; common ground; focussing; pace; and, making public. From a discussion of the meanings of these terms he moves to the description of a simple model:

1. Focusing Stage.	Topic presented in full class.
2. Exploratory Stage.	Pupils carry out any necessary manipulation of materials and talk about issues which their attention has been directed towards.
3. Reorganizing Stage.	Teacher refocuses attention, and tells groups how they will be reporting back and how long they have to prepare for it.
4. Public Stage.	Groups present their findings to one another and this leads to further discussion.

This is a neat and very simple model. It appears to suffer from two major faults. Firstly, it pays little heed to context and the nature of the transition from the conventional classroom setting to the new setting. Secondly, it neglects the substantive element. Are we to assume that the same model can be applied anywhere in the school curriculum. Is it as appropriate for PE, metalwork, chemistry, mathematics and geography? However, it is the first fault which is the most serious.

In Stage B(ii) we have highlighted a fundamental change in the roles of teacher and pupils once the threshold between stages A and B has been crossed. Whereas in Stage A the roles of teacher and learner are clearly delimited, in Stage B the pupils have, in theory at least, taken on the dual roles of teachers and learners. The teacher is seen to stand apart from the group, the principal interactions are between the members of the group and the dotted lines indicate that while the teacher continues to learn so do the pupils as individuals and as a group. In Figure 2 the distinction between the pupils, as individuals, and the teacher has been drawn. Thus teacher and pupils arrive in the classroom with experiences, expectations and goals, some subject-related others not subject-related. The change from Stage A to Stage B is influenced by these.

TEACHER	PUPIL(S)
EXPERIENCES	EXPERIENCES
Subject-related	Subject-related
Not subject-related	Not subject-related
EXPECTATIONS	EXPECTATIONS
Subject-related	Subject-related
Not subject-related	Not subject-related
GOALS	GOALS
Subject-related	Subject-related
Not subject-related	Not subject-related

Figure 2. WHAT TEACHERS AND PUPILS SEPARATELY BRING TO CLASSROOM LESSONS

Thus, in some subjects, such as geography, there will be occasions when the pupil comes to a lesson with such experience that for that lesson he has superior subject knowledge and subject skills and different attitudes to those of the teacher. The assumption generally is that teachers are superior always in all three elements but this does not have to be so. Further, we must take into account pupils' experience as members of a school class, their experience as members of groups in other contexts and subjects, and their experience as members of non-curriculum groups, e.g. informal friendship groups.

We must also take into account pupils' expectations of the teaching arrangements for a subject since these are important in setting the limits within which a teacher can work. Teachers of geography are often reminded by pupils that they are stepping beyond the limits of their subject, and these reminders sometimes refer to the substantive content and sometimes to the teaching strategies. The boundaries besetting geography may not be obvious to outsiders but teachers and pupils alike seem able to identify them. Thus, the expectations of pupils extend to what they consider appropriate behaviour for teachers within subjects. While pupils perceive groups and teams to be usual in teaching subjects where apparatus is used (e.g. Science, Crafts and P.E.), they may consider them unusual in other subjects.

For the teacher, then, experiences and expectations of pupils must be taken into account in defining goals. Clearly we can simply distinguish between subject-related and non-subject-related goals. But we can make a similar distinction with reference to classroom language. Thus we can distinguish between:

(i) language attitudes, skills and knowledge (general)
(ii) language attitudes, skills and knowledge (subject-specific)
(iii) Non-language attitudes, skills and knowledge (general)
(iv) Non-language attitudes, skills and knowledge (subject-specific).

With regard to pupils arranged in groups to work on subject-related tasks it is important to be clear which of these four areas the teacher is seeking to promote. Subject specialist teachers have been criticized by the authors of the Bullock Report and others for not paying sufficient attention to the oral language of pupils. Their concern is with all four areas. Presumably, subject teachers are most concerned with areas (ii) and (iv). If teachers are to move from Stage A to Stage B they need to be clear which of the four areas they intend pupils to focus on. Only if this is clear can the monitoring and evaluation of groups be accomplished satisfactorily.

Examination of audio-tapes of pupils engaged in group discussion suggests that some pupils can teach other pupils geography. Such tapes however hide the serious problems confronted by the teacher in monitoring several groups engaged in discussion simultaneously in the same classroom. Clearly the scope for error is enormous in pupil groups. Teachers confront all kinds of errors in pupil writing and experience difficulty in diagnosing the reasons for many of these errors. Whereas in writing the teacher may engage in a one-to-one relationship with individual pupils, in a group situation any intervention must disrupt the group. This assumes that the teacher is on hand to make the timely intervention. With several groups active in a single classroom such timely intervention is obviously a matter of chance. Further, we must not lose sight of the change in role required by the pupil: in a group he becomes a teacher-learner. Experience of teacher educators shows that preparing students to take on the role of subject teacher is difficult. Presumably pupils who are expected to be teachers in groups (and all pupils will have the opportunity to take on that role) require preparation and training. As part of this training pupils must be brought to accommodate the fundamental changes in their own roles, their relationships with their peers and with the teacher. The teacher, too, must engage in a process of accommodation.

Useful guidance in clarifying some of these issues can be obtained from studies, mainly undertaken in the U.S.A., into pupil-pupil tutoring. Allen (1976) has edited a collection of papers on this theme under the title Children as Teachers. One of the most interesting results to emerge from research on tutoring concerns its effects on the child who teaches or helps another child. Even more intriguing than improvement in substantive learning are the positive changes in social behaviour, motivation, attitudes to school, and self-concept occurring in the child doing the tutoring. The tutor frequently shows a better attitude toward school and teacher, becomes more responsible and thinks more highly of himself.

The further analysis of the effects of tutoring - children teaching other children - in subject contexts would appear to be a fruitful field for further inquiry. As in language studies there is a danger that the subject context is likely to be neglected. Tutoring studies, however, serve to reinforce the dilemma confronting teachers. They are encouraged to arrange classroom groups to engage in discussion. Research studies point to the gains which can be achieved by pupils in such groups. Yet the structural, organizational problems persist. Groups need to be constituted carefully and the members must be prepared for their new roles and trained to become teacher-learners. Groups need to be monitored and evaluated. For geography teachers there is little research evidence on which to found monitoring and evaluation strategies for group organization. Until there is more evidence of this then the transition from Stage B to Stage C (in Figure 1) is even more theoretical than that from Stages A to B. The change from the purposeful and constructive interactive whole class incurs crossing another threshold and, again, for geography teachers there is little guidance, based on careful research studies or anecdotal experience, currently available.

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Appendix : Sixth Formers discussing world energy problems

P Yes, but I mean how much would conservation actually do? Surely it should be more a question of creating ...

P Surely anything is better than nothing.

P Yeah, I know, but it's sort of ...

P But at the moment the incentive is not to conserve.

P Yes, I know but surely, yes we should try to save energy but that should not be the emphasis. It means it should be mainly sort of concentrating on creating new sources of energy rather than saving at ....

P I think you could do both.

P Yes, you could do both at the same time.

P No, I don't think conservation is valid on its own.

P No. No-one is suggesting that. I think we should ...

P ...

P The government, you know, is just not interested in ...

P Because we've got separate policies. We've got a separate gas board and a separate electricity board which both compete to sell more energy.

P It's a lot better than lots of little electricity boards.

P Oh yes. If you could nationalise into one then they might not compete so much.

P If you had a national policy to try and conserve, to promote ideas that you are, sort of, going to use wasted heat it's going to be a lot better than having several companies that are trying to sell as much energy as they can.

P But just think of a firm controlling the whole energy, all the gas and electricity.

P But we've got it at the moment.

P You just want a general government policy.

P Government controlling all the energy.

P So you're suggesting some sort of merger between the industries?

P Yeah.

P Well there should be a policy they follow which would give lower rates to industries which tried to recycle their waste energy. At the moment, it's exactly the opposite. So for example, on 'Tomorrow's World' last night where there was this company which was losing 40% of the energy it used up the chimneys. And it wanted to recycle it and it was going to gain 10% of all its electricity used by recycling it. But the electricity board charged them the maximum rate they could for the energy they were using per unit and charged them a huge standby cost just in case their system failed. So in the end, if they did go through with this scheme and recycle their energy they would be worse off than they were before. They'd be having to pay a lot more for their energy than if they just wasted it. It's silly.

P Well the fact that it was on Tomorrow's World and the fact that there's been some sort of public outcry - that means something doesn't it.

P There are a lot of cases like it.

P Yeah, too many like it.

P A lot of things could be cut down.

P Yes, the power stations are just too big so they're dangerous and they have to be kept outside the conurbation, while in Sweden they use smaller ones and they provide for, say, 150,000 and they put them in the cities and the low grade heat which would normally go up the chimneys they use for heated swimming pools and all the houses.

P Because most of it's only going up to 100°C and you can't really use that usually in industries.

P So 150°C, that's the heat which we're dissipating into the atmosphere.

T It is important to have heated swimming pools of course!

P It's cutting down, before we were using electricity straight.

P It's using a source of energy twice whereas you would have been using .....

T The point is, it may generate new uses you see. And your conservation, may generate new uses. The fact is, like in that case you may have a heated swimming pool, whereas previously it was unheated.

P But surely .....

P That's only because they had excess. They were heating all the houses, right, more or less for nothing. All the central heating and everything.

T It also seemed a slightly naive argument to me, to assume that if all the boards saved resources, then these resources were transferable to underdeveloped countries.

P No. There's more available ....

P No ...

P Even so we can use them for longer, there'd be more for the underdeveloped countries.

P We ...

T What interests me is the fact that there are a lot of resources about. Why aren't we using them at the moment? If we save them for any longer will they continue not to use them? That's what I'm after.

P Well, if you industrialise .....

P As long as they're there, it doesn't matter.

P If we use them up, then they're gone, you know.

P So we've got them there.

P We ought to be recycling things a lot more.

P It doesn't really matter if we use them or not.

P You are saying we should use these resources now. Why? Because if you industrialised the undeveloped countries they're not going to have any resources to use in their industries at all.

P There are an awful lot of resources lying on the other side of the Iron Curtain and we're never going to get to use that, and the western world has got to use what it's got now and got to conserve that as well.

P We're not really suggesting that there should be all-out conservation, but that conservation should work hand in hand with technical innovation and technical do-dahs.

I would like to thank Bryan Stephenson of the University of Exeter for this recorded extract.

ON SITTING BACK AND LETTING IT HAPPEN: HOW TO BE UNCHAINED* AND USE MICROCOMPUTERS IN GEOGRAPHICAL EDUCATION

Colin Davey**

Abstract

This paper presents a case for the use of microcomputers within geography teaching. Four major educational roles of: teacher substitution, data exploration, simulation and problem-solving are examined in the light of the author's experiences. A four-fold process of: apprehension, encounter, experience and application is identified as a likely pathway to greater use of microcomputers.

INTRODUCTION

Computer-assisted learning (CAL) is now within the reach of all geography teachers. The advent of the microcomputer has:

- dramatically reduced the cost factor;
- made machines smaller and portable;
- provided a technology compatible with past improvements in educational hardware (viz colour television);
- held out a promise of even more exciting extensions in the near future with the advent of videodisc and the various forms of video and telephone network information storage.

Geography teachers cannot afford to ignore these exciting developments. Both educational outcomes of students and the satisfactions to be derived from being a geography teacher will increase once the microcomputer is adopted as part of your set of resources for learning.

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[*] Chaining is a programming instruction which reduces memory requirements.

[**] Sydney College of Advanced Education, Sydney Institute of Education.

Britain has begun a Micro-electronics Education Program (MEP) to help schools prepare students for life in a society in which appliances and systems based on micro-electronics will be commonplace. Geography is identified as a priority subject (with mathematics, science, business studies and craft/design) within the scope of MEP. Over sixteen million dollars has been provided for the development of software (programs for teaching and learning) alone (Hall, Kent and Wiegand, 1982, 137)(1). On a population basis this is equivalent to one and a half million dollars for New South Wales! A start has been made in New South Wales with official recognition of computing as an area "in which experience may be necessary" (McGowan et al., 1981, 33) and the release of a ministerial statement on computers in education (Minister for Education, 1982). This last statement emphasises the need to generate computer awareness for all students with a special emphasis on Years 7 to 9 of the secondary school. Official thinking seems to favour a special course in computer awareness for all students though there is also a recognition that computing "may well form part of various subjects" in which this is appropriate (Minister for Education, 1982).

It is the contention of this paper that computers have a role across the curriculum. Many of the meaningful and relevant understandings, skills and values concerning computers can only be gained through applications within the total curriculum. Computers cannot be assumed to be their own stimulus and justification. They are a part of life and must be understood and utilised through integration. Geographers must accept the challenge and recognize that to be incomputerate is to be illiterate in the 1980s.

EDUCATIONAL ROLES

The microcomputer can perform a number of educational roles. Shepherd, Cooper and Walker (1980, 122) identify four ways in which geographical learning can be enhanced. These are: teacher substitute, data exploration, simulation and problem-solving(2). With the exception of the first of the four roles these are not designed to replace the function of the teacher. Even the first role is one of teacher support rather than replacement. The machine and the procedures provide a set of tools which are not ends in themselves. A microcomputer is, in one sense, another piece of educational technology which takes its place beside the 16 mm movie projector, the 35 mm slide projector, the overhead projector, the chalkboard and the video cassette recorder. In its fullest application, however, it can do much more than any one of these pieces of "old" technology.

(i) Teacher Substitute

CAL is a logical extension of those developments of several decades ago - programmed learning. Computer programs (software) can be used to provide the drill and practice sessions to assist student learning of essential geographical information(3), reinforce skills(4), or in a tutorial fashion(5). It is only the last role which really approaches the ideals of programmed learning. Branching programs allow for individual capabilities in their provision of computer assisted instruction (CAI). There are very few software packages available to fulfill the teacher "substitute" role within geography. Development is costly and demanding. In reality this role of the microcomputer is least flexible and the most difficult to develop. Popular views are that this is the sole role of computers in education. The potential and current application of CAL goes far beyond this.

(ii) Data Exploration

This is a student-centred approach to the use of microcomputers which is more clearly CAL. Enormous flexibility is available within this role since the computer is being used as an educational tool. Geography teachers, especially, can benefit greatly from the use of microcomputers to explore data. Rivizzigno (1980) coined the phrase computer enhanced instruction (CEI) to refer to the retrieval, presentation and analysis of data in this mode. She is right on target with her reference of enhancement. Learning (rather than instruction) is what results, though, when teachers use the facilities of a standard computer software package to analyze data or, better still, hand over to students (who are more likely to be computer literate anyway).

Middle and upper secondary students can be introduced to real world data which illustrates geographical concepts, develops skills or enables values to be examined. Data from the Australian Bureau of Statistics, World Bank reports, fieldwork etc. can provide input for meaningful manipulation using a program, or package of programs, prepared by others. This is when the microcomputer becomes a learning aid with minimal demands upon the teacher. Statistics cease to be frightening due to the tedious and complex calculations involved (they still need to be understood though). The concept of association, for example, can be illustrated by input of data on life expectancy at birth for selected countries and data on gross domestic produce per capita for the same countries. Readily understood commands to plot one variable against the other provide a visual display (on the monitor screen or printer) of the association. Calculation of the correlation co-efficient permits a statistical measure of the degree of association(6).

Microcomputers also offer the possibilities of information retrieval whether this information is non-numeric or numeric. When data becomes available on floppy disk this will permit students to obtain and use census data, production statistics etc. A supplier of software, such as Micro-Educational, 17 Park Road, Garden Suburb, N.S.W. 2288, will be able to advise on available software. STATGRAPH FILER, available from local suppliers, handles both alphabetical and numeric data. If you have a printer, word processing programs are available from around $150. These offer sorting facilities such as alphabetic and postcode which could be used to handle survey data to extract spatial summaries.

Mapping is a familiar activity to geography teachers. Use of a digitizer, such as the Apple graphics tablet, enables direct use of map-based or graphical information. In association with the program package (total cost of software and digitizer is about $900) it is possible to measure distances, areas, create and store maps and much more. Analysis of drainage networks in geomorphology is a tedious task manually. A digitizer removes the drudgery enabling concentration upon the concepts and principles which are represented by the data analysis. Any map scale can be accommodated provided that the working area is within the confines of the operating surface of the digitizer.

(iii) Simulation

Use of games, simulations, simulation games and role play has become a familiar part of the geography curriculum. It may be that the ability of microcomputers to offer operating models of real world processes (or theories about these processes) offers the most comfortable introduction. Start here if you feel uncertain of data exploration or teacher "substitution". This writer began with a simulation.

VILLAGE (Payne, Hutchings and Ayre, 1980) is a simulation designed to develop concepts related to the selection of the best location for an agricultural village in a hypothetical environment. Students are given the task of choosing locations in order to minimise travelling needed to carry on the basic activities of the settlement. The simulation is an excellent example of educational software. It can be used in whole class, small group, or individual learning situations.

Do not use VILLAGE as a gimmick for its novelty value. Wise users of non-computerised simulations integrate these within curriculum topics. Microcomputer simulations are no different. VILLAGE provides an excellent accompaniment to real-world case studies of small agricultural communities where mechanisation and technology are at low levels. Concepts of location, network, movement and accessibility can be supported and extended by appropriate use of this simulation.

Initiatives by Forer and Stokes in New Zealand (Forer, 1981) have led to the development of a set of computer programs forming the N.Z. CITY unit. These programs were designed specifically to use the graphics capabilities of the Apple 2 plus microcomputer to simulate aspects of urban growth, a normative model of urban rent (Alonso) and spatial competition for retail trade areas. WEBER, available as part of GAPE initiatives, uses Alfred Weber's simple normative model of least cost location to permit student exploration of assumptions and applicability of the model. GRAVITY is based upon HUFF's probability model of consumer choice of a shopping centre (Shepherd, Cooper and Walker, 1980, 93-99) and is also available from GAPE(7).

In the United States a consortium of computer users has been formed to review and test computer materials for educational use. CONDUIT(8). One package, DEMO-GRAPHICS, simulates factors affecting the growth of world populations. The programs include 1980 data on population, fertility and mortality for 40 countries(9). Another CONDUIT package models the interaction of the U.S. economy, energy supply and demand, and the physical environment(10) to enable undergraduate students to study the formation of public policy.

(iv) Problem-Solving

The ability to write a computer program is needed to solve open-ended problems. Shepherd, Cooper and Walker (1980, 176-180) discuss the pros and cons of students writing their own programs and argue that secondary school students should have fundamental programming skills. Since secondary school mathematics courses now include computer programming (e.g. Jones and Couchman, 1980), this ability exists in embryo. Students are likely to provide resources to assist teachers of senior secondary geography classes. Teachers with abilities in BASIC(11) and PASCAL(12) language will also increase in numbers. High level languages are being developed which remove many of the restrictions of present languages. These new languages sound and read like normal dialogue and will be even easier to use. For the present a lack of ability to write computer programs is no restriction on using microcomputers in your teaching. This can come later. There are other problem-solving possibilities with your micro which are both powerful and easy to use.

The microcomputer can be used to assess student progress by testing. Tests can be "given" by the computer which also maintains a record of results. Speedy analysis of results permits diagnosis of learning difficulties, enabling re-teaching or the provision of corrective assistance. Payne, Hutchings and Ayre (1980, 207ff) provide a readable introduction to the testing function of microcomputers. They point out that testing is restricted to multiple choice questions, true-false items and those questions which require a one-word answer. A set of programs (four) is given to establish a computer assessment system.

Many schools have begun to use microcomputers because of their clerical functions. To many school administrators this may be the selling point. Information storage and retrieval systems are available as software packages which establish files able to be enlarged and modified(13). Written and graphical reporting facilities enable this information to be obtained as required. No longer need there be groans of dismay when asked to identify the number of Welsh born male students with Norwegian mothers. Automatic data processing makes it easy once you've bought the software.

Word processing systems promise to revolutionise some routine tasks(14). Changing programmes (curriculum) becomes easier when a word processing package enables new references, content samples, or units, to be inserted and then re-typed automatically. The advent of videodisc will extend the range of microcomputing by virtue of both its extended storage capacity (e.g. 100 hours of music or 50,000 slides on one side) and the capacity to integrate computer programs, maps, text, slides in teaching sequences.

Communication with other computers and equipment is also possible with the microcomputer. Use of an acoustic coupler such as the Electromed Sendata 700 (costing $325.00) makes it possible to connect a telephone to your microcomputer. Programs, mail and data can be exchanged with other schools or with a central distribution facility. One Sydney educational computer supplier(15) has installed a hard disk system which will permit such exchanges. In similar fashion data and software access by telephone should be a feature of the telephone network information service once this is established in Australia(76).

BUT WHAT ABOUT ME?

Those of us with little or no knowledge of computer programming languages need feel no handicap, however. Use of microcomputers is not dependent upon creative capacity. There is a growing array of available software to supply the four forms of learning support identified above. Suppliers of software for microcomputers are rapidly increasing in number. Intelligent use of software does not depend upon programming ability. This is to say that the microprocessor is something to be used and is neither an object of awe or enslavement. A powerful learning aid is available. Maximising its potential becomes a possibility when at least three things take place(17). These will be called *encounter*, *experience* and *application*.

A fourth element in the process is *apprehension*. Perhaps this is where we all enter the arena? Once it is realised that microcomputers are an easy to use tool and do not require mathematics, our apprehension should be dissipated. Certainly our students do not seem to show such apprhension. They are the computer generation. Let's join them.

Encounter

Most secondary schools are in the position of having at least one microcomputer. These are often in the mathematics or science departments. Most of us only know that they are there. We have possibly seen the machine as we scurry past an open office door or glimpse a classroom occupied by engrossed students surrounding a demonstrator. Perhaps we have senior students who are learning to programme in BASIC as part of their mathematics curriculum? Maybe this is why we have done no more than encounter the notion of computers. Are they mysterious machines which only mathematicians or those rare expert logical thinkers can employ? Fortunately our fears are groundless.

Experience

Those of us who have had the good fortune to be assisted in the process of unlocking the mysteries of the machinery have begun the awakening. This is more likely if we have witnessed the use of a ready-made package with relatively simple user demands. Unfortunately these are rare in schools. Many new teachers, however, will have included a course, or module, on computing somewhere in their pre-service education. Teachers who have taken advantage of in-service opportunities may also be available within the reservoir of potential. Watching someone at work is the best way of realising that those enormous and complex instruction books need not be a barrier.

Application

Once we have seen details of a program which is designed for a geography course our interest may have been heightened. Actually getting someone to make it work for us or being able to obtain a working version makes it likely that we can enter phase three. Application gets us to the real fun. Strange, isn't it, we have heard that before? Weren't overhead projectors, tape recorders, movie projectors and spirit masters all like this once upon a time? We began to use educational technology after the stimulus of both hardware and software and now equally creative in our stencil-making, recording and photography. Of course the ready supply of software guarantees continued use. At present this is a real barrier to the widespread application of computers in the geography curriculum.

The writer has been through the three phases described above - always with the aid of others. What follows is an attempt to help you find a place for what will be a major part of life from now on.

How it Happened

Feeling that geography was in danger of being left behind some questions were asked of a mathematician proficient in the use of microcomputers(18). She was helpful and also recalled a brochure giving details of a read-made package(19). This was ordered, obtained, unpacked and unused for a while since no time was available for experience. While dust was gathering a chance ecounter with a publisher's display really got things moving. There was a book called Computer Software for Schools(20). A quick flip through the pages revealed a chapter titled: "Village: a geography simulation". Even more excitement followed the discovery of the complete program listing in BASIC (Beginners All-purpose Symbolic Instruction Code) which is the language of most microcomputers. Encounter was one thing, however. How was the program to be made workable? Fortunately the experience was provided in the form of a talented young physicist employed at Sydney Institute of Education to assist people just like me(21). Once Stephen had the program working my task was easy. All that remained was to turn on the machine, load the diskette, and remember two lines of instruction for the Apple. The rest was easy - answer the questions and follow the instructions which came up on the video screen.

"VILLAGE" is not self-contained within the machine. Maps, tasks and data accompany the programs. The Apple was, indeed, just a tool to help develop the concepts of location, distribution and interaction as I chose possible sites for a farming community with the objective of minimizing movement to various resources required for everyday living. As the programmers reminded me, with their closing message on the screen, to continue with the tasks in my workbook I knew I felt at home and comfortable. At last I had entered the realm of Computer-Assisted Instruction (CAI). What was just as pleasing was that I didn't need to spend hours (days?) reading mysterious words about bytes, interfaces, REM, ROM, sub-routines, interprogram communication, system dependencies and so on. I was intrigued when one reviewer wrote about "a POKE command which will make the PET do something new" (Haigh, 1980, 13). Was this something to do with unique PET-oriented items or integrated graphics? Clearly my interface must be getting on a bit! How nice it was to sit back and let it happen. Others could GOSUB ON, GOTO and enjoy CHAINing. All I had to do was switch on.

POSTSCRIPT

The world of microcomputers is one of rapid change and a large array of hardware. It has to be stressed that choice of hardware is a difficult task. Purchasers need to be aware of system capacity and adaptability. A cheap initial system may require expensive additions to be really useful. In the end it seems that for a given capability the costs of competing brands are much the same. Compatibility of programming languages and software should be considered. There are several disk operating systems, for example. It is possible to buy interfaces (plug-in circuitry etc.) to overcome some of these problems though. How long should one wait to reap the "benefits" of new models. My advice is to start now. How long did you wait to buy a colour television set?

Software availability has been a restriction until recently. Present indications are that this deficiency is ending. Commercial and professional services are now gearing up to meet the demand. Education has taken a place behind business applications and "arcade" games but this is probably due to varying rates of acceptance by the three communities.

Software evaluation has to be considered. We need to establish, and apply, appropriate criteria to the pre-purchase decision making. As well as traditional criteria of age/grade level, concept and skill pre-requisites, presentation, graphics, objectives, cost, durability etc. there is a need to consider a range of criteria more concerned with the learner-software transaction and the software-computer interface. Questions of: curriculum relevance, student benefits (compared with non-computerised alternatives), teacher and student support material, timing, student grouping etc. need to parallel those of: computer hardware/memory requirements, graphics capability, technical documentation etc.

These are challenges well within the grasp of the erstwhile geography teacher. Our acceptance of microcomputers will continue to stimulate a marketing response. Our use of software will create a climate within which evaluation of both software and learning outcomes will proceed.

FOOTNOTES

1. The first MEP software package for geography is Climate. It is available from Heinemann Computers in Education, a division of Heinemann publishers.

2. Payne, Hutchings and Ayre (1980, 1-2) identify two other uses. These are management of the learning environment (testing and assessment) and clerical functions. The section on problem-solving refers to these.

3. An example of place learning is the EUROPE game described by Shepherd, Cooper and Walker (1980, 123) but details of source are not given. The GEOGRAPHY program available on floppy disk as one of a number of programs (all non-geographical) is an accessible example. This can be obtained from: The Secretary, MEG Software Scheme, Mathematics Dept., Mitchell CAE, Bathurst 2795. Send a blank diskette and $1.00. State type of machine and operating system. Request Disk No. 2.

4. HURKLE is a program used to reinforce skills of grid references. This is available as part of the Geographical Association Package Exchange (GAPE) service. At the time of writing the exchange service was being disbanded. Refer to the most recent issues of Teaching Geography for for availability.

5. A learning module, Introduction to Weather Charts is produced and marketed by Zenith Education Systems, P.O. Box 505, Bankstown, 2200. The module consists of a set of 20 "questions" but for some items there is a facility for "remedial" branching to give extra practice if an incorrect response is given. Details of individual student performance (including responses given) are retained for subsequent checking and diagnosis by the teacher. PLATO (Programmed Logic for Automatic Teaching Operations) is an expensive tutorial system requiring special hardware connected to a large central computer. The system is marketed by Contol Data Australia.

6. Students at Sydney Institute of Education have used the INTERSTATS package in this way. INTERSTATS is a versatile data analysis package which permits most of the standard statistical analyses (correlation, regression, mean, standard deviation, scatter diagrams, analysis of variance, chi-square tests etc.) INTERSTATS is produced by Serendipity Systems (New York) and is sold in New South Wales by Computerland, Clarence Street, Sydney. Cost is about $200.00. Shepherd, Cooper and Walker (1980) describe the use of a package, developed by Shepherd, called NUDE. The CORR program, available from GAPE outlets (Geographical Association Package Exchange) enables calculation of product moment and rank order correlation co-efficients. This last package is much less expensive.

7. GAPE has ceased to function as a distributor. Its new role is one of evaluation rather than exchange.

8. CONDUIT is an acronym for Computers in Oregon State Uni., North Caroline Educational Computing Service, Dartmouth College and the Universities of Iowa and Texas. The consortium publishes a quarterly magazine, Pipeline.

9. CONDUIT materials are available in Australia from Science Education Resources Pty. Ltd., P.O. Box 130, Blackburn, Victoria, 3130. Demographics costs $87.00 inc. postage and is Apple compatible.

10. UNITED STATES ENERGY, ENVIRONMENT AND ECONOMIC PROBLEMS. This is usable only on the TRS-80 microcomputer and costs $57.00. Note that all CONDUIT programs are designed for undergraduate courses.

11. BASIC is an acronym for Beginner's All-purpose Symbolic Instruction Code. It is the language used by microcomputers because it is economic in its computer memory space requirements as well as being easier to use than previous programming languages. It was developed in 1970 by Professors J.G. Kemeny and T.E. Kurtz at Darmouth College (U.S.A.).

12. PASCAL is an acronym for Programme Applique a la Selection et a la Compilation Automatique de la Litterature. The language is used to store and retrieve information and is regarded as a structured language likely to rival BASIC. PASCAL is being made available on many microcomputers. Shepherd, Cooper and Walker (1980, 36) regard it as less cumbersome than BASIC and more suitable to geographical problems. Currently BASIC is in general use.

13. An example is the P.F.S. Information Management System which handles filing, reporting, graphing at a total software cost of $415.00. Individual functions can be bought for about $140.00 each.

14. Some examples are Zardax, Sandy's, Spellbinder and Screen Writer II. These range in price from $150 to $550.

15. The Computer Shop, 210 Parramatta Road, Stanmore, 2048.

16. Britain's PRESTEL service is one example. Australians await a government decision.

17. These three things assume the existence of a microcomputer in the school. At Sydney Institute of Education the geographers decided to purchase Apple products because of their reliability, widespread use, flexibility, available peripherals and software. A system with a capacity of 48K was selected. Many micros lack this capacity which is essential for use of disk drive and other peripherals such as the graphics tablet. K = kilobyte. A kilobyte is 1024 "bytes" (or characters) of information such as the letter "x" or the number "3".

    An apple II+ with 48K costs about #1,300. A disk drive with controller costs about $600.00. (Use of a disk drive is far superior to a cassette device for reliability, speed and ability to purchase software in machine-ready format.) A black and white T.V. monitor costs about $135.00. For $2035.00 a basic system is obtained. Later, a printer (about $900.00) and graphics tablet (about $900.00) and a colour monitor (from $500.00 with necessary PAL adapting card) provide a first-rate system.

18. Joan Wilcox, lecturer in mathematics, Sydney Institute of Education.

19. "Introduction to Weather Charts", Zenith Education Systems, Bankstown.

20. Payne, Hutchings and Ayre, 1980.

21. Grateful acknowledgements to Stephen Souter, Physics Department, Sydney Institute of Education. Of course not everyone has access to programmers. This does not prevent us using their products though. The critical fact is being able to adapt the language (programming instructions) to suit the particular microcomputer system.

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THE ARMIDALE HERITAGE STUDY:

A CASE STUDY IN APPLIED RESEARCH

IN

PRE-SERVICE TEACHER EDUCATION.

E. S. Elphick and Warren Halloway

Illustrations by David Rose

Centre for Social Science Education
Armidale College of Advanced Education

A B S T R A C T

This paper describes a heritage study of the Armidale built environment and the way aspects of the Study were integrated with a pre-service teacher education programme. In 1981 the City Council of Armidale received a modest grant from the Heritage Council of New South Wales to undertake a study of the city's built environment. With the official support of the College authorities the authors involved first year teacher-education students in an aspect of the Study concerned with the domestic architecture of the City. The students' contribution was part of an interdisciplinary social science course based on the local region so that the evidence they gathered was capable of interpretation in a wider context. The Study is seen as a long term one which will eventually result in a substantial printed and photographic report which could form the basis of future policy. It is also hoped that the participating students will have developed useful skills, knowledge and attitudes which they can pass on to the next generation in their role as teachers.

> "Australia is the small house..."
>
> Robin Boyd, *Australia's Home*, 1952.

> "The geographer brings to historical conservation and historical archaeology the two concepts of 'landscape' and 'region' ... contextual study may be a contribution to a multidisciplinary study of the historical landscape, in which many others including engineers, architects, historians, archaeologists and demographers have a part to play."
>
> Jeans, D. J., Oct. 1981.
> "Geography, Landscape and Historical Conservation."

The last decade in Australia has witnessed a remarkable growth in interest in conserving the national heritage whether this is seen as part of the natural or built environment. Much valuable work has been done and continues to be done by government agencies and various community groups. Frequently the dedicated amateur acts from strong convictions but blissful ignorance in efforts to conserve the environment. This paper takes the view that there is an important role for geographical educators in this task. The role seen as most promising is one of applied research in local conservation studies as part of pre-service teacher education programmes.

The Genesis of the Armidale Heritage Study

The Heritage Council of New South Wales was formed in 1977 after the impetus of the Federal Heritage Commission which came into being in 1976. Funds were available for conducting Heritage Surveys and before he left for Katoomba, the Armidale City Council Town Planner, Mr Tony Towers, applied for and received a grant of $2,500 for such a study in Armidale. With Mr Towers' departure the City Council sought assistance from the wider community to carry through an Armidale Heritage Study. A select group met on 21 August 1981 to consider what could be done to prepare a Local Environment Plan which could cover heritage matters in the city. This was possible under the Environmental Planning and Assessment Act, 1979.

Three Sydney based experts attended this inaugural meeting, Miss Cherie Bourke, and Messrs Brian McDonald and Hugh Fraser. At this meeting Mr E. S. (Jock) Elphick suggested that College sutdents in the second semester Local Studies course (Social Science Unit) could provide an intelligent group to conduct much of the initial survey work required on the built environment of Armidale. At a subsequent meeting held in the College's New England Historical Resources Centre the planning group was informed of the preparedness of the College to co-operate in this project.

Messrs Elphick and Halloway designed a methodology for training students and conducting the survey. A pilot scheme was carried out with one group of about 60 students in late 1981 to test the feasibility of the proposed methods and especially to check the reliability of the training programme.

The success of this pilot scheme led to the implementation of the survey in second semester 1982 involving all first year primary teacher education students (approximately 170 students). About 75 per cent of the city has currently been surveyed including the area covered by the pilot scheme in 1981 and excluding the central business district and its immediate precinct which has been the subject of another study. This central area of the city was gazetted on March 5, 1982 as worthy of preservation and 26 buildings were listed including such diverse structures as a band rotunda, chapels, churches and cathedrals, hotels, banks, the courthouse and a stables.

The Local Studies Course

The authors were convinced that the Armidale Heritage Study was not only extremely important for the city but involvement of the College students in the Study would also be a valuable experience for them.

Besides courses in Education Studies and Curriculum Studies, Armidale C.A.E. B.Ed. (Primary) students are required to take courses in general education of an integrated mode. Called "Contextual Studies" these courses are designed to provide the knowledge background necessary for an adequate understanding of the context in which teaching and learning takes place. Because teaching is mainly concerned with the development of children's abilities, interests and attitudes these courses seek to provide students with understandings and skills necessary to organise learning experiences for children in interesting and meaningful ways.

In first year (Semesters I and II) three themes are developed, each occupying a four week unit in each semester, namely:

Man as part of the Biophysical System,

Man in Social Environments,

Man's Response to Environment through the Arts.

All are highly integrated units involving teams of lecturers in interdisciplinary teaching in the Sciences, Social Sciences and Arts respectively. In the first year all units focus on the *Local Area* and develop the two major concepts of *interaction* and *change.*

Turning now to the social science units (Man in Social Environments) the first semester unit involves a consideration of traditional aboriginal society and pioneer European society in the New England Region. Interaction within and between these communities is studied through field studies, lectures, film, readings of primary and secondary resources, a visit to the local Folk Museum and in discussions. Students also make a careful study of the Myall Creek Massacre. In this unit the local historical landscape is observed by visiting the pioneer squatter station of *Saumarez,* the gold field at Rocky River and the small town of Uralla. The evolution of the nineteenth century historical landscape is traced and relict features of the natural and man-modified environment in rural and urban settings are observed and recorded.

In the second semester unit the contemporary New England society and landscape is the main focus of study. Again a range of learning experiences is employed, especially excursions into the urban and rural environment to observe and record changes in land-use, settlement patterns, communications, industrial and commercial features of the landscape. It was in this latter unit that it was considered appropriate and manageable to devote one week (6 hours) to the Armidale Heritage Study.

The Training Scheme

The week allocated to the Armidale Heritage Study was divided up as follows:

1. The Training Session (2 hours)
2. The Field Survey (3 hours)
3. Follow-up discussion and collation (1 hour).

The training scheme consisted of a lecture outlining the reason for the Study, namely:

1. To develop social science understandings and skills.
2. To develop awareness, sensitivity and commitment to local conservation based on sound knowledge.
3. To be involved with the local community and to make a practical contribution to the Armidale Heritage Study for the city.

Several coloured slides were shown to illustrate features of houses and to show how the Heritage Survey Sheets were to be completed. (See Appendix 1.) In this session terminology was explained and illustrated, e.g. gables, hipped roofs, terra cotta tiles, finials, wrought and cast iron, bull-nosed iron, bay windows, French doors, etc.

A set of coloured slides mainly of local houses was then shown and students were required to record the period of construction. Four broad periods were chosen on the suggestion of the Sydney experts (See p.1) as suiting Armidale's development and to determine a task which was not too formidable for the students, namely: nineteenth century; 1900-20; 1920-50; 1950 +. The same set of coloured slides was then shown again with comments to reinforce the ideas and system of recording to be completed in the field.

Each group of two students was issued with a large manilla envelope containing:

1. 50 survey sheets for the approximately 40 houses in the allocated city block.
2. maps of the city showing (a) location of the block, and (b) an enlarged map of the block showing individual allotments.

3. A sheet of illustrations of house types and terminology as a reminder. (See Appendix 2)

The Reliability Check

In 1981, immediately prior to the pilot scheme being conducted, the authors carried out a survey of twenty houses - ten from each of two adjacent city blocks. These lecturer-completed survey sheets were then compared with the sheets returned by the respective student groups. A very high degree of correspondence was noted with only one house being classified two periods away from that nominated by the lecturers. The information gathered by the students was considered more than adequate in detail and accuracy to justify the initial confidence in the proposed survey. Random checks to individual houses have been made as lecturers moved around the city assisting students in the field.

The Field Work

The students were required to work in a three hour session (a Thursday morning 9-12a.m.) completing their observations, discussions and recording. They were advised to keep together to support and question each other's judgements. From the Reliability Check described above the authors had concluded that each house would require 3-5 minutes and that three hours would be an adequate time allocation.

Students were also given advice on handling enquiries by householders and how to deal with hostile or talkative residents. Students were instructed not to enter private property and to persevere even if boredom occurred when some house types were repetitive in an area.

Students were required to use their completed survey sheets during the follow-up session and to submit them to the authors so that methodical collation, mapping of findings and further investigation of "interesting, unusual or good examples of particular buildings" could be undertaken by the authors or the planning group at a later date.

The Follow Up

This one hour session was very important as it provided an opportunity to deal with problems, to discuss patterns and to make comparisons between blocks surveyed in different parts of the city. Groups were allocated blocks in different parts of the city to ensure that each tutorial group of 16-20 students had a diverse experience to bring back for discussion.

Patterns in the age of houses, materials and styles of construction, social milieu and evidence of change were enthusiastically reported. Reasons for such patterns and changes were also suggested and ways of testing the validity of such reasoning were considered.

Much attention was given to changes in technology of water, gas and electricity supply and the provision of sewerage and transport systems. Architectural styles were also linked with changes in technology of construction and periods of economic prosperity or depression.

Many students reported interesting features which could be identified with local tradesmen such as the superb brickwork of the master brick maker and layer, Mr George Nott, seen in the cathedrals and many large houses built early in this century. Other features reflected local conditions, e.g. many Californian bungalows have their verandahs closed-in especially on the south facing frontages as a way of minimising the effects of Armidale's bracing winter. Many houses are built with a view to catching the sunny northerly and easterly aspect. Some older houses such as *Cometrowe* and *The Turrets* were built in this way and now present their rears to the main street in their neighbourhood. Ashlar weatherboarding, resembling blocks of stone, was a common way to decorate the frontage of working-class cottages of the early twentieth century. The city has a large number of substantial Victorian brick mansions, generally single storey, such as *Loombra*, with elegant cast iron decorations, bay windows, beautiful barge boards in the gables and coloured glass. These features indicate the local affluence of the 1860-90s boom years which continued a little longer in Armidale despite the 1890s depression elsewhere, thanks to the gold field at Hillgrove, 30 km east of the city. Students were also quick to notice the prevalence of the local Armidale "blue brick" and the common use of this with light yellow bricks to produce walls, public buildings and houses with highly decorative polychrome patterns.

The students were able to appreciate the way Armidale's urban landscape presented a story which could be read from the features they identified. Government policy was noted as a significant factor, particularly in determining the grid street pattern laid out by surveyor Galloway in 1849 and only recently modified with cul-de-sacs and curving crescents on the city fringes where subdivisions of the post World War Two years are found. Economic factors were also readily observed to have influenced house styles. The transition from the charmingly decorated Californian bungalows of the 1920s to the austere versions of the 1930s stand side by side on many streets. The boom period of the 1950s and 1960s with the rapid growth of the University of New England and the Armidale C.A.E. produced numerous brick veneer houses of increasingly varied styles in the 1970s and also the readily identifiable estates built by the State Housing Commission. Technological change was also appreciated by students who noted changes from timber to brick to concrete; from shingle to slate, iron and tile and from timber framed casement windows to aluminium and plate glass. Not the least significant was the provision for the ubiquitous motor car which was finally provided with its own space in the house under the family roof by the 1970s.

All of these factors and others such as fashion and idiosyncratic taste were noted by students and they were seen to mesh and contribute to an interesting and significant landscape.

The social science units in both semesters I and II provided knowledge which enabled the urban landscape of Armidale to be interpreted in its regional context. The visit to *Saumarez Station,* for example was an occasion to point out the beginnings of Armidale in 1839 when G. J. Macdonald, the Commissioner of Crown Lands, set up his headquarters on *Saumarez* at the present site of Macdonald Park adjacent to The Armidale School.

From its foundation Armidale enjoyed the advantages of primacy, nodality and greater size because of its administrative and service functions in the southern New England Tableland. Pastoralism has been the dominant industry of the region despite attempts to diversify the economy especially with wheat growing from 1860s to the arrival of the railway in the early 1880s when the local product met competition from cheaper and better 'Adelaide' flour. Mining has had an ephemeral history in the region, at times booming, as at Rocky River (1850s) and Hillgrove (1890s) and at other times receding and leaving behind ghost towns.

The trend towards closer settlement in the latter half of the nineteenth century and the growth of rural hamlets left a continuing mark on the rural landscape surrounding Armidale. The students visited two such centres at Saumarez Ponds and Dumaresq which were populous at the turn of the century. The well preserved rural Gothic church of *St. Nicholas* Saumarez Ponds was one of three churches in this area together with the schools, farmlets and houses, cricket ground, tennis courts, and cemetery. Dumaresq had a post office and a railway station, the latter now used for fertiliser trans-shipment and storage. The drift of population to the towns and metropolitan cities has markedly depopulated the rural centres and industries of the region. This occurred in response to mechanisation on farms, motor transport and the growth of job opportunities in urban based secondary and tertiary industries with a slight pause in the immediate rural hinterland during the boom years of the 1960s and 1970s when sub-division of rural holdings into hobby-farms was common.

The selection of Armidale by the Anglican and Catholic Churches as the see for their respective dioceses in 1869 led to the construction of the cathedrals and the development of an ecclesiastical function for the city extending far beyond the Tableland. This function was further developed as the churches established secondary boarding schools for boys and girls. By the turn of the century Armidale had a reputation as an education centre which was assiduously developed by local citizens and politicians. The most significant development in the twentieth century has been the foundation of the Teachers' College in 1928 (now Armidale C.A.E.) and the New England University College in 1938 (now the University of New England). The extensive external studies courses conducted by both institutions and the students and staff they attract have given the city a national and even international character at variance with its size (about 20,000).

The participation of the students in the Armidale Heritage Study enabled them to discover how such factors as the physical environment, government policy, ecclesiastical decisions, Country Party power, fashion and technology interacted to produce a distinctive regional landscape. The Study also exemplified Jeans' (1981) argument that practitioners from several disciplines can make important contributions through a multidisciplinary approach to study of the environment, particularly the historical landscape.

Summary

It will be useful to summarise the features of the Armidale Heritage Study which seem to have given it a particular character and to have ensured its success to date.

1. It had its genesis as an *official Heritage Study* sponsored by the City Council. It had wide official community support.
2. The *College gave its official backing* and it had the enthusiastic support of the authors who believed in its intrinsic merit.

3. Students' participation was demonstrated in a *pilot scheme* to be feasible and reliable.
4. Students participated in the Study as a part of their *normal course work.*
5. The survey was an example of an *interdisciplinary study* with contributions from several social scientists - particularly historians and geographers.
6. The Study received modest but adequate *funding.*
7. The Study has available the assistance of an *expert photographer* and *cartographer* and the resources of the New England Historical Resources Centre.
8. The Study is a *long term* one which will carry over to 1983 and is likely to be concluded in 1984.
9. *Outcome for the City.* It is hoped that a substantial printed and photographic report of the architectural features of the city will emerge. This report could form the basis for future policy by the Armidale City Council on the architectural heritage of the city.
10. *Outcome for student teachers and teacher educators.* The students who have participated in this Study will become teachers who have hopefully, become aware of the need for conservation of our built environment on the basis of careful and well considered information. They will have developed some knowledge and skills in such a field of endeavour. It is also hoped they will be sensitive to and appreciative of their heritage so that they can pass on such knowledge, skills and appreciation to the next generation. College staff have also gained from such research and have gained from helping each other to achieve insights and skills not so readily attainable if they had worked separately.

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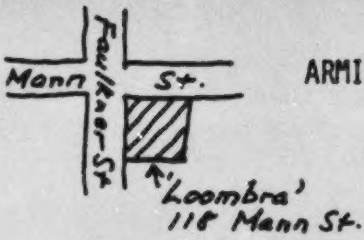


ARMIDALE HERITAGE STUDY

SURVEY SHEET

File No ....

Survey No ....

Name of Item: ..'LOOMBRA'........................Date of Listing ......

Location/Address of Item: 118 MANN ST. CNR MANN & FAULKNER.
(Record corner locations)

General Description: ..HIGH VICTORIAN, SINGLE-STOREY..
..MANSION..

Use: [✓ Residential]; Commercial Building; Professional Offices; Public Buildings; Other.

DESCRIPTION

(a) Period: [✓ 19th Century]; 1900-1920's; 1920's-1950; Post 1950.

(b) Approximate Date: ...1888.........

(c) Designer/Architect/Builder: ....

(d) Condition: [✓ Excellent]/Good/Fair/Deteriorated

(e) Integrity: [✓ Intact]/Damaged; [✓ sympathetic]/unsympathetic alterations/[✓ additions]

(f) Building Materials: Walls - [✓ Brick]; Timber; Fibro; Render; Other
Roofs - [✓ Corrugated Iron]; Other Metal; Terra Cotta Tile; Cement Tile; Slate; Fibro Shingles; Other

(g) Fences: Picket; Brick; [✓ Paling]; Hedge; Park Rail; cyclone type· other

(h) Significant features of buildings, gardens, grounds or environs e.g. [✓ gables], [✓ barge boards], [✓ cast iron decoration], lead light windows, [✓ chimneys], [✓ chimney pots], [✓ doorways], [✓ formal gardens], [✓ trees], gateways.

(i) Remarks: COMPLETE CAST-IRON LACE DECORATIONS, VERANDAH POSTS, VALANCES, RAILS, BALUSTRADES & GABLES. WROUGHT-IRON FINIALS, BAY WINDOWS WITH MARTELLO TOWERS, CEDAR TRIM & INTERIORS (?) OGEE BULLNOSE IRON VERANDAHS, WITH PYRAMIDAL TURRET-ROOF OVER BAY WINDOWS, FRENCH WINDOWS, NEAT FORMAL GARDEN · FEATURING LARGE HIMALAYAN PINE.

N.B. SHOULD BE INSPECTED BY PANEL — TO BE PRESERVED AT ALL COST.

ARMIDALE HERITAGE STUDY

TECHNICAL AND OTHER DETAILS

File No................

Survey No.............

Name of Item: ....

Location of Item: ....

Title Description: Lot, Allotment or Portion No: ....

Section No: ....

DP, SP, FP: ....

Parish: ....

Zoning and Affectations: ....

....

Present Threats: ....

Conservation Recommendations: ....

....

INVESTIGATION AND RESEARCH

Listing by Other Agencies: ....

Research references: ....

Other documents: ....

Site investigations: ....

Records, plans, drawings, photos: ....

Biographical reference: ....

DATE OF NOTIFICATIONS

Owner: ....

DEP (HCB): ....

Australian Heritage Commission: ....

National Trust: ....

Other: ....

ADMINISTRATIVE MATTERS

Inspection date: ....

Inspection date by HCB for items of State significance: ....

Map reference no: ....

Photo reference no: ....

Author of citation: ....

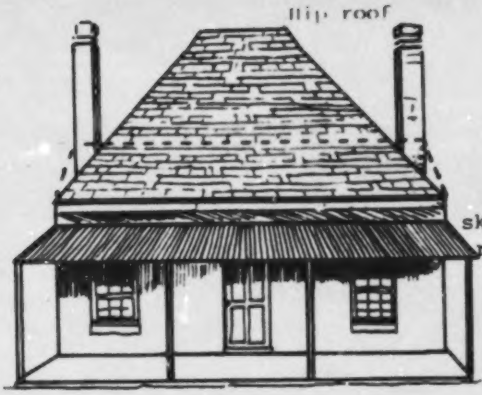
OWNER

Name: ....

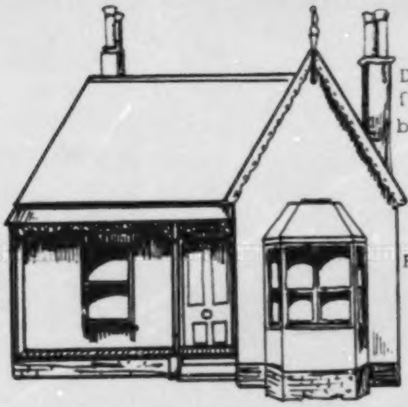
Address: ....

Lessee (if required): ....

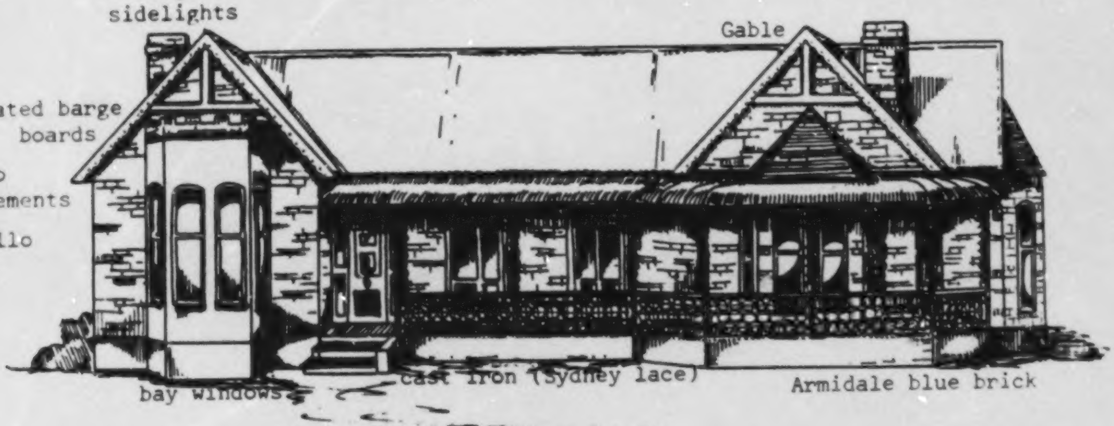
Appendix 2


Hip roof
skillion roof

COLONIAL GEORGIAN
1850 - 1870
Simple, plain, balanced

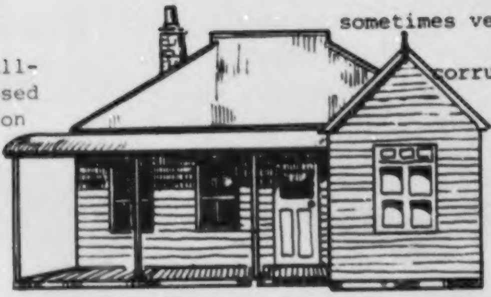

Finial
Decorated fretwork bargeboard
cast iron valances
Bay window

VICTORIAN GOTHIC
1850 - 1880
Assymetrical, decorated, "romantic".

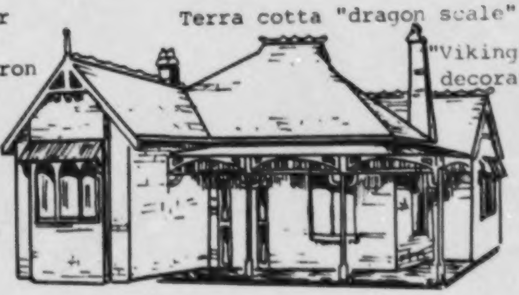

fanlights
sidelights
Gable
Decorated barge boards
Pseudo battlements
Martello Tower
bay windows
cast iron (Sydney lace)
Armidale blue brick

"LOOMBRA", 118 Mann Street
circa 1890

THREE NINETEENTH CENTURY HOUSES


sometimes ventilator
bull-nosed iron
corrugated iron
awning

TIMBER FRAMED WEATHERBOARD COTTAGE
1860 - 1920


Terra cotta "dragon scale" tile
"Viking" gable decoration

FEDERATION STYLE
1901 - 1916

TWO C.1900 - 1920 HOUSES

Appendix 2 (continued).

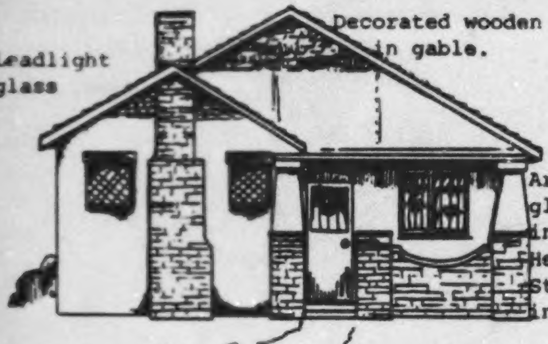
SIX 1920-1950 HOUSES

Double Gables a feature

Leadlight glass

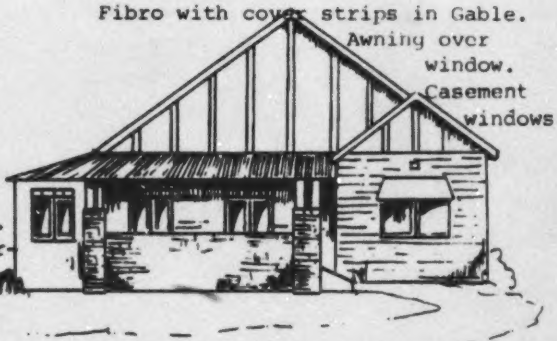
Decorated wooden shingle in gable.

Art-Nouveau glass design in windows.
Heavy pylons.
Stucco rendering on brick



A Californian Bungalow decorated version typical of 1920s.
Verandahs often closed-in in Armidale.

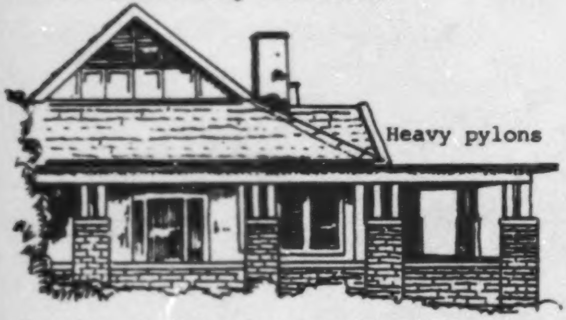
. Iron roof
Weatherboard
Fibro with cover strips in Gable.
Awning over window.
Casement windows.



An austere Californian Bungalow typical of the 1930s.

Several gables often facing in different directions
Ventilators in gables
Wide surrounding verandahs.

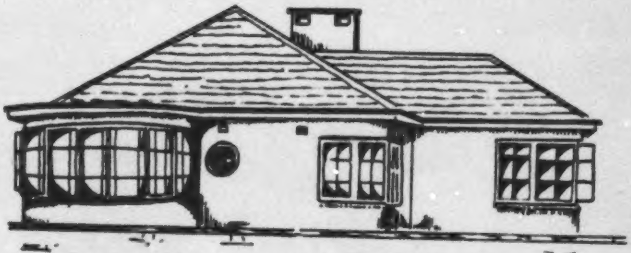
Heavy pylons



Gracious Californian Bungalow with Federation style influences 1920s,30s.

An elaborate Californian Bungalow

Tile roof, brick with rendering.
Port-hole windows and rounded corners.

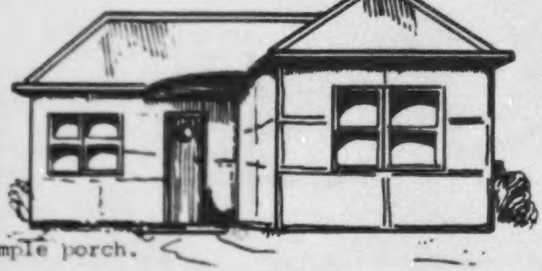


~~Variously called International,~~ Waterfall, Art Deco, Ocean liner or Ship-shape. Popular in 1930s.Commonly cement rendered and painted white with blue trim.

Waterfall (ship-shape)

Iron roof, sometimes tile.
Low hipped roof.
Port-hole in door.

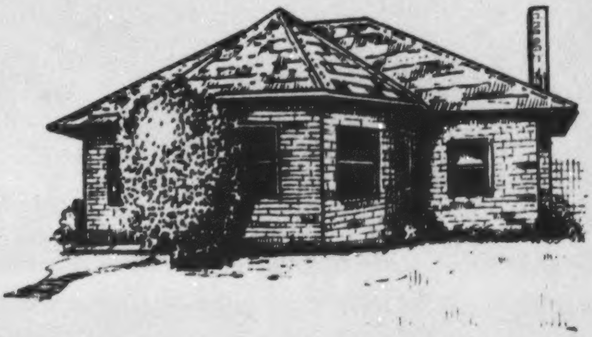
Double hung windows



Simple porch.

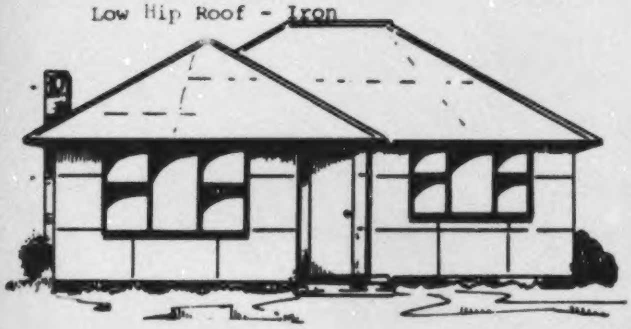
Simple austere "L-Shape" Post W.W.II, 1940s.

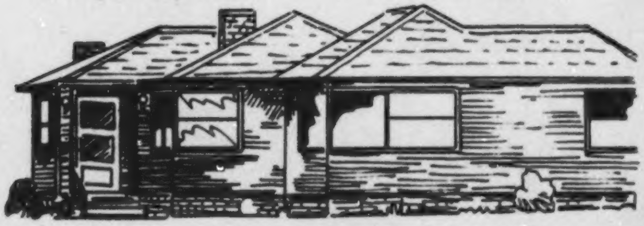
Post W.W. II brick home built 1948 - Austere. Features large bay room - Terra Cotta tiles.More affluent version of Post-War house.



Appendix 2 (continued)

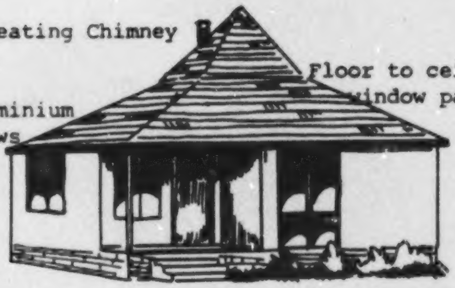
SIX POST 1950 HOUSES


Low Hip Roof - Iron

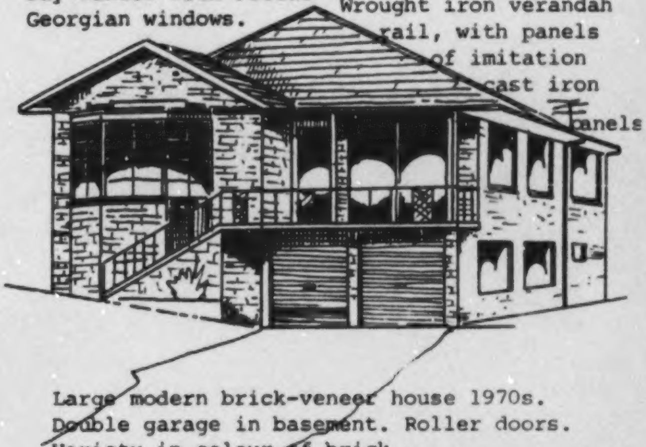

Multiple hip roof
corner windows

Triple front 1950s, 60s Brick and weatherboard. Often log-cabin weatherboards. Sometimes wood stained and varnished rather than painted.

An Asian "Coolie Hat" small house.

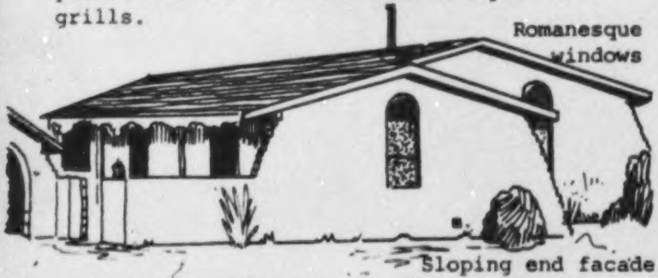

Oil Heating Chimney
Floor to ceiling window panels
Aluminium Windows

State housing 1970s. One of several styles in an estate. Use of variety of materials to avoid monotony - brick, fibro, timber, hardieboard.


Tiled hip roof with front gable
Bay window with Pseudo-Georgian windows.
Wrought iron verandah rail, with panels of imitation cast iron panels

Large modern brick-veneer house 1970s. Double garage in basement. Roller doors. Variety in colour of brick.

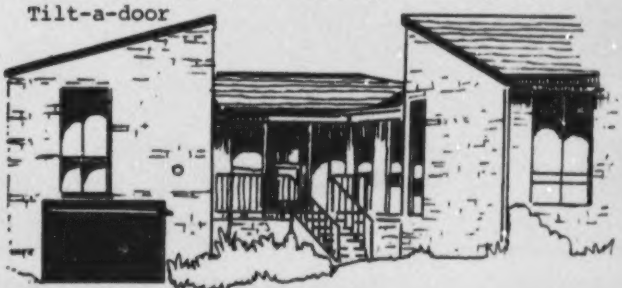
Low tiled roof, sometimes with half round terra-cotta tiles.
Brick and cement-rendered, painted white.
Walls entending from house forming court yards. Panels in walls with wrought iron grills.


Romanesque windows
Sloping end facade to accent Spanish style.

Mediterranean or Spanish Hacienda Style-1970s

Randomly placed, geometrical shapes.
Factory style roof
Brick veneer. Sometimes on concrete slab.

Aluminium floor to ceiling window panels.


Tilt-a-door
Garage in basement

Assymetrical modern - 1980s.

INVESTIGATING THE NATIONAL ESTATE: SOME OBSERVATIONS FROM AN IMPLEMENTATION STUDY

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ABSTRACT

This paper presents some results of an implementation study conducted for the Curriculum Development Centre, Canberra, Australia. The Investigating the National Estate kit of educational materials, which focusses upon various aspects of Australia's heritage, was placed in selected schools for implementation, and also evaluated by groups of teachers. Some observations, based upon reactions to the kit design, are presented here since they have wider relevance to the preparation of curriculum materials for geographical education.

INTRODUCTION

The Investigating the National Estate kit of educational materials represents a significant attempt to present teachers and learners with ideas and resources intended to promote awareness and understanding of certain aspects of the environment. The kit draws the attention of learners to their relationship with components of the environment which have special significance for the present and future people of Australia. Competence, concern and commitment to appropriate action for the preservation of Australia's National Estate are also aimed at within the kit.

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Resource materials for use in secondary schools have been provided in this kit prepared by Helen Simmelhaig and five other writers for the Curriculum Development Centre and the Australian Heritage Commission. The kit was published by the Curriculum Development Centre in May, 1980. Materials in the kit are divided into four units which investigate various aspects of Australia's heritage. Unit One introduces the concept of the National Estate. Unit Two looks at the importance of aesthetics in deciding what should form part of the National Estate. Unit Three investigates historic and cultural surroundings. Unit Four promotes understanding of interdependence and conservation of natural surroundings. Each unit consists of a set of activity and resource cards. A teacher's booklet, filmstrip and audiocassette are also included in the boxed kit(*).

One reviewer (a planner) has described the kit as a "cultural landmark" which will "take discussion of heritage out of the realm of blue-rinsed prissiness and elitist preciosity" (Wagner, 1980). Whether such intentions become reality can only be determined after the kit finds its way into Australian secondary schools. One approach to monitoring such a process is to observe how the materials are used by teachers in the classroom. This was a major concern of the implementation study from which this paper derives. It is equally important to be aware of teacher and student reactions to the design and content of the curriculum materials from a pro-active perspective since these may influence the likelihood of initial implementation (by teachers) and that of subsequent use (based upon student reactions). These aspects are also considered here.

The study derives from a request by the Curriculum Development Centre to conduct an intensive study in association with the dissemination of the Investigating the National Estate kit. Two areas of investigation were specified:

(*) Further details are provided in Curriculum Development Centre, 1980.

(A) to determine how the National Estate Kit was being used by teachers; in what subject areas and at what levels, and to gather data on the effectiveness of the conceptual model and the adequacy of the learning experiences contained in the kit;

(B0 to provide information on the effectiveness of the dissemination strategies used in making the National Estate Kit available to schools; this included gathering information that could be used in the further dissemination of the kit.

Two institutions were selected by CDC to conduct intensive studies. These were Deakin University and Sydney Teachers College (now Sydney Institute of Education). Full reports of these studies are contained in Robottom (1981) and Milne and Davey (1982). This paper selects from sections of the Milne and Davey study which have general relevance both to the conduct of similar studies and the preparation of curriculum materials for geographical education.

THE IMPLEMENTATION STUDY

The implementation study was not an evaluation of what educational outcomes were achieved by a selected group of users. It was rather a set of observations made during the context and process of exposure to an educational innovation. In that the emphasis was upon meaningful description and interpretation of what took place when teachers began to use the kit, the study can be said to provide an illuminative evaluation (Munro, 1977, 7).

This type of evaluation is designed to obtain and provide information useful for making decisions and judgements for subsequent improvement of Investigating the National Estate and similar educational materials.

The study however, lies within the broader context of curriculum evaluation. The emphasis is upon within-school observation and monitoring, with a view to describing and understanding the responses of teachers to an innovative educational provision. Examination of the materials within the context of the classroom provides information on actual uses and outcomes which may be at variance to the intentions of kit designers (Davis, 1981, 21).

The procedures adopted were influenced by several considerations and the paper should be read with these in mind. Since the initial report was aimed at the developers of educational materials within the orbit of the Curriculum Development Centre, this intended audience was influential in the choice of procedures. Cost considerations limited the number of schools within which the kit could be studied. Within schools there was no attempt to guide how the kit might be used, although its use across a range of subject areas was encouraged. Teacher reactions form the basis of most observations, since the concern was to study how the materials were or would be utilized. Student reactions were canvassed to a limited extent only. These were, however, extremely illuminating and it is recommended that subsequent studies of a similar nature make much greater use of student reactions to educational materials and processes. Students are, after all, the prime reason for education systems and should play a much larger role in reports about the curriculum process. Participating schools were selected in an endeavour to typify Sydney metropolitan responses and so minimize any local bias.

Evaluator bias should also be considered. Both writers are convinced that environmental education should be a major curriculum emphasis and have welcomed the opportunity to observe teacher and student use of a set of materials intended to encourage several aims of environmental education. The writers have prepared their own educational materials which are designed in part to achieve environmental goals concerning the national estate and heritage (See Davey, Emery and Milne, 1980, pp 8-10; 137-177). Personal benefits have flowed from contact with teachers and students who have provided suggestions for the format and content of future projects.

Most data were obtained from teacher-kept records of curriculum transactions. These were generally in the form of a log of events, or diary, in which key activities, the problems encountered, consequences, samples of work etc., were recorded. Some structuring was provided for these observations to ease the task of reporting(*). An additional evaluation was obtained from presentation of the kit and selected contents to groups of teachers not in the five participating schools. These teachers have provided useful pro-active judgements concerning both the total set of materials and particular components.

Objectives of the Study

Study procedures were guided by the following objectives:

1. To determine the ways in which classroom teachers adopted and adapted the materials contained in the National Estate Kit.
2. To assess the type and adequacy of the learning strategies contained in the kit.
3. To collect perceptions of the materials from students who have been exposed to the kit.
4. To ascertain teacher reaction to the design, format and content of the kit.
5. To discover the perceived relevance of the materials to existing curricula.
6. To understand the likely effects of the kit on school administrators, school curriculum developers, other teachers and parents.

Methods of Investigation

To operationalise the aims and objectives, the following strategies were devised. The decision to adopt these particular strategies was based partly on a reading of the current literature on curriculum and materials evaluation and partly on consideration of the internal organisation of New South Wales secondary schools and likely teacher reaction to the investigation.

(*) See Appendix 4 of Milne and Davey, 1982.

1. Free Trialling of Kit Materials in Selected Schools

Six metropolitan high schools were approached and their co-operation sought to implement this strategy. The high schools chosen consisted of two girls' schools; two boys' schools and two co-educational schools. No attempt was made to establish a cluster of schools in a particular geographic location of the Sydney Metropolitan Region, rather the sample was chosen in order to reflect a range of socio-economic backgrounds from different geographic locations.

Teachers were free to implement the materials as they thought best within their particular curriculum context. No guidance was given, or suggestions made, on how the kit might be employed. Investigating the National Estate was handed to teachers and left to be its own stimulus and guide.

Teachers were then encouraged to participate in the study by using the materials with their students as they saw fit and to be involved in: (i) keeping a diary of their observations; (ii) filling in a detailed questionnaire at the end of the study and in meeting in a general plenary session with the investigators to discuss experiences.

2. Evaluation of Materials by Teachers Involved in Post Graduate Diploma Courses in Educational Studies

Sydney Teachers College, one of the host institutions of the study, has approximately 350 teachers enrolled in part-time post-college professional development courses. The investigators decided to involve teachers enrolled in two of these courses, the Post Graduate Diploma in Environmental Education (for both primary and secondary teachers) and the Post Graduate Diploma in Geographical Education (for secondary teachers only), in a workshop-seminar evaluation of the National Estate Materials. Enrolment in these courses is conditional upon the registrant being a practising teacher with at least a recognised UG 2 award and having at least two years practical experience in the classroom.

Three-hour class-group workshop seminar sessions were programmed in normal class time for teachers enrolled in the above courses (approximately 50 teachers in total).

3. Student Evaluations of Unit Cards

A suggestion by a teacher at one of the schools led to what proved to be a most interesting and illuminative section of the study. This consisted of obtaining student reactions to the format, style and content of particular unit cards. While these responses are somewhat outside the ambit of teacher implementation and response to the educational innovation (the major aim of the study) their inclusion serves to highlight at least two points. Firstly, students, as the consumers of the product, are especially incisive and ready to respond. Secondly, it is the response of students which will ultimately be a major influence on both the readiness to use and re-use a package on the part of the teacher and this response will be crucial in how the learning process develops.

SOME FINDINGS ON MATERIALS DESIGN

Six objectives were identified for the study. These objectives guided observations of the implementation of Investigating the National Estate with a view to providing feedback on both design and dissemination of this and similar kits. Our recommendations are set out to accord with the objectives and the two central purposes. The numbering system begins with the reference numeral for kit design (1). A second numeral is used to identify the objectives as set out earlier. Sequence within these recommendations is labelled by the third numeral. Thus, 1.2.2 is a recommendation on kit design arising from the assessment of the type and adequacy of learning strategies and is the second recommendation linked to this objective.

1.1 Classroom Adoption and Adaptations

1.1.1 *Include an index to provide a pathway to the concepts, skills and values in the kit.*

Teachers tend to be opportunist within the everyday constraints of the classroom with a tendency to categorise new materials within their current timetable engagements. An index of concepts, skills and values should enable linkages to the ongoing school programmes. More importantly, the index would permit a better understanding and articulation of the conceptual model underlying the kit design. Help could be given to show how the four units could be integrated into a unified programme.

1.1.2 *Include guidance on pre-lesson requirements for particular unit cards.*

Suggestions for associated resource and reference material (such as film, filmstrip and atlases) needed to make most effective use of particular cards would enable better translation into the classroom. Teachers need increased skill and confidence in handling new materials. Support material suggestions can reduce the problems which arise from the special preparation needed to use much of the materials.

1.1.3 *Provide guidance on curriculum co-ordination.*

Most teachers view the kit according to how it fits into existing subject areas and timetable compartments. It is difficult to see any form of inter-subject use in secondary schools without guidance on how the school curriculum areas might co-ordinate kit use across the disciplines (i.e. transdisciplinary approaches).

1.1.4 *Objectives should be made clear on cards (or in handbook) in order to facilitate learning of concepts, skills and values.*

An innovation from a national curriculum centre can provide a stimulus for developing curriculum frameworks of teachers. Statements of general objectives and specific intended learning outcomes of cards should act to convey the environmental education model of the kit as well as facilitating evaluation of intended outcomes.

1.1.5 *Clarify the purposes of the kit to save teacher time.*

The implementation study revealed that many teachers simply saw the kit as a subject enhancer. The underlying intentions of the kit were obscured. Diagrammatic communication may reach the "scanning" teacher adopter scurrying to obtain a lesson idea. Few teachers were cognisant of the nature of Australia's National Estate. For most users the notion was new. Teachers were learners embarking upon the process of discovery along with their students. The central theme of the kit must not be allowed to escape users.

1.1.6 *Reclassify school target groups as middle secondary and above.*

General and specific reactions on the notions and readability of the kit confirm that Years 9 and above form the most favourable target audience. Abstract concepts such as heritage and National Estate are likewise more appropriate for the middle and senior secondary years. Curriculum advisers for the New South Wales Higher School Certificate General Studies Syllabus perceived the kit as a senior level package. Implementers saw most use beyond Year 9.

1.2 Type and Adequacy of Learning Strategies

1.2.1 *Make learning tasks more structured and to make greater use of the stimulus material on each card.*

Teachers expressed reservations about certain cards which contained learner tasks totally divorced from the stimulus material. Learning tasks which made extensive use of the on-card stimulus material were most favourably received. Likewise graded tasks which structured learning served to reduce demands on teacher time when cards were used for individual student work. Structured learning tasks facilitate higher order cognitive skills especially.

1.2.2 *Make objectives apparent on task cards.*

Not only were teachers more likely to adopt cards with a clear statement of objectives but these were generally judged to be better.

Identification of intended learning outcomes (a better term than 'objectives') appears to have carried over to produce preferred learning strategies.

1.2.3 *Extend the range of skills strategies for learners.*

There is a tendency to be repetitious in skills involved from one task to another. Thinking skills of analysis, synthesis and evaluation are amongst those areas neglected. More detailed task specification within structured learning activities utilising stimulus materials provides exemplars for teacher users as well as enhancing the achievement of goals concerning the National Estate.

1.2.4 *Intersperse learner tasks throughout the text of the cards.*

Teachers were more inclined to use cards which structured learning by inclusion of tasks within the text. Units 1 and 4, in particular, were identified as needing activities to be other than at the end of the cards.

1.2.5 *Reduce the level of abstraction in some cards.*

Secondary school students to Year 10 are not (in spite of some textbook theories) capable of abstract thought to a large extent. While mathematical concepts may be entered as 'formal operations' what evidence exists (e.g. CDC/AGTA, 1980) suggests that junior and middle secondary students of the social sciences need more concrete experiences than those generally provided. Teacher implementers of Investigating the National Estate supported the views of the few researchers who have entered the realm.

1.3 Reactions of Students

1.3.1 *Provide more variety in learner tasks.*

Student reactions were generally in tune with those of teachers. They responded to variety between and within task cards in learner activities.

1.3.2 *Provide more case study examples which are likely to be known to learners.*

Students responded to familiar examples of the National Estate such as the Great Barrier Reef and Ayers Rock but were less enthusiastic about more peculiarly local examples. A national kit does have problems in meeting all user requirements but it may be profitable to give guidance on related samples of Australia's National Estate which exist in various parts of Australia. Teachers and students would be in a position to choose regional case studies. These increase the likelihood of conceptual development of learners. Movement from the known to the unknown becomes more probable.

1.3.3 *Provide the variety needed to minimize student boredom.*

Where task cards are likely to be used by individual students in a sequence there is a need for learning activities to be variable from one card to another. As one student said: "Cards are interesting for a while but then it would get boring".

1.3.4 *Make students aware of the fact that every place has a history.*

It is a sad commentary upon the historical sense that students and teachers engage in lessons about far away places when local history is both rich and meaningful. The same applies to geography. Suggestions and examples of how to find out about an area can help overcome this phenomenon.

1.3.5 *Avoid frustrating the learner by making unreasonable demands in tasks.*

Learners (and teachers) are sensitive to materials which require extensive or (often) impossible extended research using resources not readily at hand. Where reference sources can be anticipated in a school library this presents no problem, provided specific mention is made of the appropriate sources.

1.3.6 *Control readability of cards.*

Units 1 and 4, especially contain many cards where reading levels are above those pertaining to the target groups. Teachers are sensitive to readability levels of textual materials and resist use of items perceived to be difficult. In part this arises from exposure to English-as-a-second-language students. For average and below average Australian born students reading difficulties will produce loss of essential meaning and diminished interest detrimental to the intentions of the kit.

1.4 Format and Content

1.4.1 *Reduce reading extent by interspersing activity and text.*

Concentration spans are a source of concern to teachers. Overlengthy passages of text render memory and detail paramount rather than the development of concepts, skills and values.

1.4.2 *Allow for the purchase of extra copies of cards.*

Teachers expressed a strong desire for class sets of cards as a separate item. This enables central location of the complete kit but subject use of sections. A danger here is loss of intention from the kit once other units are separated from Unit 1.

1.4.3 *Colour-code the cards in each unit.*

A request for ready identification when more than one unit is in use in the same classroom. How many kits suffer from disarray because of tedious reconstructions needed following classroom use?

1.4.4 *Provide a stronger box.*

Durability of the kit box has been poor. True, masking tape works wonders. This may be preferable if cost increase is too great.

1.4.5 *Provide better plastic wallets.*

Plastic wallets for sets of cards are more of a problem than the box. Once the welded seams give out the pockets cease to hold their contents. A kit which is in disarray, or has missing cards, is less likely to be used again.

1.4.6 *Improve the reproduction of black and white photographs.*

Some cards have tasks which are rendered difficult or conjectural due to poorly reproduced detail in photographs. Copying for use by classes is rendered more difficult.

1.4.7 *Add colour photographs.*

Key cards, at least, need colour photographs. Any textbook or kit without colour is deficient in the 1980s. Even microcomputers come with colour video displays. (Who goes to see black and white movies?) Australia's National Estate is spectacular. Why should it be portrayed as grey or brown?

1.4.8 *Provide clear maps and diagrams which comply with conventions and allow interpretation.*

Maps, especially, must be accompanied by scales, northpoints, titles and keys as well as complying with general cartographic conventions where colour is involved.

1.4.9 *Provide a filmstrip with each unit.*

Users liked the filmstrip with Unit 1. This gave rise to regrets that other units were not similar. Colour frames on a filmstrip may be one way of overcoming the lack of colour on the Unit cards. Revision and reinforcement of key ideas about the National Estate is facilitated by an available filmstrip.

1.4.10 *Provide two copies of the Teachers Handbook.*

Where a kit is likely to be used by a number of subject departments, sections of the kit will become dispersed. The environmental education objectives are more likely to be obscured if a Teachers Handbook is not available.

1.4.11 *A source book is desirable.*

A book which contains details of each card plus the present handbook plus extension ideas and references would be welcomed by users. This almost results in a National Estate book for teachers but the combination of ready reference and extension both facilitates use and encourage supporting activities in keeping with the objectives of the kit.

1.4.12 *Make large photo cards.*

The availability of large format photo cards (in either black and white or colour) would enhance the value of the Unit 1 filmstrip. Teachers would have a basis for classwork on photograph interpretation, study skills, values education, discussion starters etc. Photo cards could be used for classroom display. This would serve a dual purpose: student cognitions of Australia's heritage would be reinforced; teachers and students would be reminded of the availability of the curriculum materials for incorporation within existing programmes.

1.5 Relevance to curricula

1.5.1 *Make explicit reference to ways of using the kit in science courses.*

As a group, science teachers were those least likely to make use of the materials. There was an expressed desire for more "experiment-based activities" to be included. This seems to be due to a misconception regarding the intentions of the kit.

1.6 Side effects

1.6.1 *Show how the materials are relevant to established courses and syllabuses.*

School administrators, curriculum developers, teachers and parents must see the kit as a contribution to what is already in the school.

1.6.2 *Provide a resource list.*

Inclusion of a list of library/resource centre purchases needed to make the most of the kit would assist. Indications of subject linkages would be made clearer.

1.6.3 *Produce a teacher reference book.*

An allied activity of the Australian Heritage Commission should be the production of an affordable, usable and accessible reference book for teachers and other target adults. The proposed publication would provide considerable support for the content of Unit 1 and provide ready reference for users of other units wishing to extend ideas, skills and values found on particular unit cards. Proposed content would include case studies of examples of Australia's National Estate.

CONCLUSIONS

Teachers have reported satisfaction with, and enthusiasm for, the overall intentions of the kit. A number of perceived shortcomings has been found but these were overlooked by teachers making a general summation. Whereas the cards themselves were, in most cases, seen to pose some problems for class use almost all teachers exposed to the whole kit would recommend the kit to others. In making this judgements however, many are considering the stimulus given to themselves as educators as a result of exposure to an educational innovation.

Best use of the Investigating the National Estate kit requires a positive attitude to the Australian heritage. The kit aims at the dedicated and converted environmental educator. It may well represent a "cultural landmark" (Wagner, 1980, 71) but teachers need considerable help if there is to be cultural change. Particular aspects of this help include:

- increased skills in managing materials and resources;
- changes in classroom style;
- familiarization with, and readiness to use, inquiry approaches;
- abilities to overcome problems which arise from the special preparation needed to use the kit effectively.

These are aspects which arise during the diffusion process of any educational innovation.

Curriculum design and materials production are preludes to the diffusion process. This process of moving curriculum material into the purview of teachers (Eisner, 1979, 48) is far from being a marginal stage. Inappropriate use can see the end of the best designed materials. Inadequate exposure of teachers and resistances to new demands likely to be made by the unfamiliar materials may preclude adoption entirely. Dissemination is a critical step in the process of bringing about the desired changes in schools and classrooms which prevent the innovation being a sterile exercise. What teachers do and what students experience identifies the National Estate kit within the educational process.

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EDUCATIONAL MATERIALS AND THE CORPORATE SECTOR: SOME IDEOLOGICAL IMPLICATIONS

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ABSTRACT

The contraction of public sector funding of education has had many effects, one of which is an increased tendency for teachers and subject associations to look to the corporate sector for assistance in the preparation and production of teaching materials. The willingness of sections of the corporate sector to both finance and provide resources and research assistance in this task is to be applauded. However, the power of schools and teachers to promote and legitimise, albeit inadvertently or otherwise, the ideology and activities of the companies concerned, should not go unnoticed. This paper examines this issue through a case study of a teaching package on the bauxite industry prepared for economics and geography teachers by the Queensland Economics Teachers' Association and Comalco.

The existence of bias in teaching and the consequent promotion - consciously or unconsciously - of specific ideologies is now recognised. Bias is apparent in the orientation of subject matter (Smith, 1977; Harvey, 1973; Gill, 1980.) and is reflected in the development and utilisation of educational materials.

Educators have taken some time to accept that the teaching of economics, both as a discrete subject and as part of a broader discipline integral to other subject areas, is fraught with overt value judgements and concealed conservative bias. Lee (1974) has identified a number of sources of bias in economics education. These include:

1. A blurring of the distinction between positive and normative economics. Hence teachers may be guilty of assuming that the aims of their economics courses can be objectively determined when in reality ethical and value positions impinge on these decisions.

2. An over emphasis in economics courses on a particular hypothetical market - the perfectly competitive model - and the risk that teachers and students will come to consider this the ultimate economic structure.

3. A preoccupation with the objectives of efficient resource allocation, economic growth and stability, and a general unwillingness to confront the issue of economic justice or the equitable distribution of income.

4. An unwillingness to discuss the outcomes of economic policy, particularly since positive economics implies consideration of the means rather than the ends, and the consequential likelihood of an uncritical acceptance of the perceived goals of economics, towards which any policy is directed.

5. An acceptance of simplistic behavioural assumptions particularly in relation to notions of consumer sovereignity and hence a concommitant disregard for the realities of marketing and advertising.

The impact of courses embodying these biases (be they in economics or a related discipline,) is to encourage a belief in and acceptance of a competitively free-enterprise society, and further, the existent reality of such a system. The teaching of economics has become nothing more than education for free-enterprise - as indeed it is frequently known in the United States. (National Survey of Economic Education, 1981). It behoves educators not only to be critical of this, but also to be concerned about any developments in economics education that further reinforces the idealisation of capitalist ideology. It is in the context of this latter concern that serious questions need to be raised about the wisdom of teachers looking to the corporate sector for information and explanations in relation to the operations of the Australian economy (Sibly, 1982); and additionally, whether co-operation between teachers and business people will lead to the production of educationally acceptable teaching materials.

This paper will consider in some detail my observations in relation to one educational kit that clearly manifests the dangers of teachers accepting too readily the information provided by the corporate sector. The kit is entitled: The Bauxite Industry with Specific Reference to the Weipa Region. It has been produced by the Queensland Economics Teacher's Association (Q.E.T.A.) and Comalco, and is currently being offered for purchase to teachers of economics and geography in that state and elsewhere. It should not be assumed however that my consideration of just one collaborative kit implies a paucity of examples;

in fact, they are by no means uncommon. The Geographical Association of Western Australia and Alcoa have for example, recently developed materials concerned with: Selecting an Alumina Refinery Site (Robinson and Mitchell, 1981) that mirrors many of the undesirable features of the Q.E.T.A./Comalco bauxite package. Additionally, it appears likely that we can expect to see an increase in the production of this sort of material as the corporate sector increasingly fills the vacuum created by the retreat of public funding from education.

The level of ideological selection in the presentation of any data is reflected in the extent to which the interests of a particular group are served by the utilisation of such techniques as: implicit assumptions, emphases, stereotypes and, importantly, by the trivialisation of certain issues and evasion or omission of others. Clearly, in relation to my assessment of the bauxite kit, it was important to consider whether the concerns of education-specifically economics education-were being met by these materials, or if Comalco and the corporate sector had more to gain from them.

The Q.E.T.A./Comalco bauxite kit consists of:

4 eleven page information booklets
4 copies of a set of eight work cards
1 wall chart depicting (a) flow chart of the bauxite to aluminium refining process and (b) a map of the major bauxite mining, alumina refining and aluminium smelting plants in Australia.

It represents the first in a proposed set of three kits designed to examine the bauxite, alumina and aluminium industry in Australia.

An examination of these materials indicates that the data provided is purely descriptive and highly selective. At the informational level, the major portion of this kit is concerned solely with the mechanical operations of Comalco at Weipa, while the broader issues of the Australian bauxite industry in relation to world production and reserves receives only superficial attention. More importantly however, the almost exclusive use of Comalco company data and the failure to provide any alternative perspectives on the operations at Weipa ensure that the information presented is supportive of Comalco's (current or potential) activities.
For example:

1. The booklet mentions in two separate sections that the bauxite reserves in the Weipa area are thought to be in the vicinity of 3000 million tonnes.

Considerable space is taken up to demonstrate that 60% of Australia's known bauxite reserves are in Cape York and that these Queensland ore fields have the highest alumina content of the Australian deposits. The implicit assumption underlying these remarks is that ultimately these ore bodies should be fully exploited.

2. The "generosity" of Comalco to its employees and the extent of the company's investment in the town facilities are also well-documented as are the nature and number of employment opportunities in Weipa.

A deliberate selection of information designed to enhance the corporate image of Comalco is evident in the extent to which some issues of relevance are either ignored or addressed in a trivialised manner.
More specifically:

1. No mention is made of the existence of the Weipa Aborigines although their battle for compensation for the land they lost is well documented elsewhere (Roberts, 1975, 1981). Students would be forgiven for believing that Comalco entered an empty land!

2. No consideration is given to the Aborigines living in the Weipa area today. Are we to assume that they enjoy employment with Comalco and the facilities of the town? Furthermore, suggestions that Comalco practices apartheid in Weipa or has reneged on its promise to establish an aboriginal trade school (see Roberts, 1981 pp. 107-111) have been judiciously ignored.

3. Although the booklet indicates the amount or royalties paid by Comalco between 1977 and 1980 no mention is made of the after tax profits of the company for any period!

4. The kit trivialises the question of the "land rehabilitation" that follows mining. (Significantly, earlier pre-publication drafts of the booklet were far more expansive on this issue). No mention is now made of the extent to which the land elevation is lowered by strip mining procedures and the range of problems that may ensue from this. Additionally no explanation is given as to how "land reahabilitation" and "regeneration" - terms used in the booklet - are consistent with "a programme of experimental and large scale planting of selected trees, crops and pastures considered to have potential commercial value". (Booklet p. 10)

5. The contentious issue of foreign ownership and investment in Australia's bauxite deposts has been treated in a cavalier fashion. For example, Table III in the booklet entitled: Main current and potential mining and mineral lease holders in Australia notes that: Kaiser Aluminium and Chemical Corporation, and C.R.A. both have a 45% holding in Comalco Ltd, the remaining 10% being publically owned; but no information is give of what "publically owned" means in this context. Similarly, Aurukun Associates are shown as consisting of Billiton (66.6%) and Pechiney (33.3%) but no mention is made of the fact that Billiton is a wholly owned subsidiary of the Anglo-Dutch Shell Company, while Pechiney is a French concern. Clearly, details of ownership and control of Australia's bauxite production and reserves should have been provided in order to enable students to gain some appreciation of the implications of foreign ownership and investment in Australia. They might then wish to question the authors' statements about "our aluminium industry" as it is described in the booklet on page two.

Apart from the whole issue of selectivity, doubts must also be raised about the objectivity of this kit with respect to the accuracy of the data that is provided. For example, in discussing the provision of infrastructure at Weipa the booklet notes that:

> "housing and community facilities, ports communications, power and water supplied (sic), mapping (and) the study of climatic conditions ... were all paid for by Comalco." (p.8)

We are informed by the booklet, that until 1981 the Queensland and Federal Governments had spent $2 million on the provision of "services and housing for government employees: compared with the $34 million that Comalco had spent on "township developemt". Other sources seem to indicate however, facilities in Weipa. Jan Roberts notes for example, that under the Comalco Act of 1957 the Queensland Government provided £8.5 million for the development of the harbour and mining town facilities (Roberts 1981, p. 97). It would seem that the information provided by the booklet may be misleading, but this situation is further exacerbated by suggestions that injustices exist in the provision of government funding for infrastructure facilities. It is stated that:

> "In established towns and cities, most of these facilities are provided by Federal, State and Local Government authorities. In the more remote areas limited assistance only is offered by governments." (Booklet P. 9)

Armed with inaccurate and/or incomplete information and "fired up" with suggestions of inequality students are then asked to address the question:

> "Do you think that the Government or Comalco should have borne the cost of providing the infrastructure at Weipa? Give reasons for your answer." (Question 3, Work Card 3)

What response might be expected from students?

The educational usefulness of this kit must be judged against the perceived goals of education. These are of course subject to continued and heated debate; but in addition to the promotion of "knowledge", it is now generally accepted that education should foster critical thinking and decision making skills; develop a measure of social concern whilst fulfilling the needs of the individual. This kit may provide some information - albeit of a rather deficient kind - but none of the materials encourage any sort of critical evaluation of the bauxite industry or the operations at Weipa. Indeed as a result of the materials presented students and teachers are likely to feel well-disposed to both what the Australian industry can contribute to current and future supplies of bauxite, and the nature of Comalco's operations at Weipa which are depicted as free of industrial, social and enviromental problems. Additionally, there is nothing in the kit which aids teachers to utilise the information to construct educationally meaningful pedogogical strategies.

The extent to which this kit can contribute specifically to economic education is similarly open to doubt. The central issue in the Queensland Economics Syllabus rationale relates to the promotion of economic literacy, a term that appears to defy precise definition - at least in that document. If economic literacy is to be interpreted as: learning to live *within* the Australian capitalist system without questioning its basic values then perhaps this kit has something to offer. It must be suggested however, that if economic education is to aspire to contribute to those goals of education mentioned previously, then economic literacy must imply more than a superficial examination of Australian capitalism. Efforts must be made when developing materials dealing with economics content, that they elucidate, clarify and ultimately question the values and attitudes underlying the capitalist ethic. Unfortunately kits such as this one suggest that there is nothing about the Australian free enterprise system that requires further consideration let alone questioning.

A number of worrying conclusions and consequent questions emerge from my consideration of the bauxite kit.

In the first instance the kit clearly rationalises and legitimises the activities of Comalco at Weipa, whilst offering little that is educationally valid.

Secondly, although it is a matter of concern that such biassed materials as these are to be made available to schools, what is even more alarming is that they have been developed - in part - and endorsed by the Q.E.T.A. an organisation of professional teachers. Studies in the United States indicate, furthermore, that support such as that provided by the Q.E.T.A. endorsement, is likely to encourage significant utilisation of the kit by other teachers. (National Survey of Economic Education, 1981). The Q.E.T.A. has not only acquiesced to a particular ideology of economics and education by the development of these materials, it has also ensured the further promotion of it in schools and ultimately in the wider community.

Analysis of the bauxite kit gives rise to questions about the extent to which conclusions drawn from it are typical of other teacher/business enterprises whether completed or proposed. Clearly there is room for further research on this issue, but the following observations are tentatively advanced at this stage.

1. In providing the funding for the production of educational kits, companies are motivated by a desire to ensure that their operations are seen in a flattering light. Generally speaking they are unlikely to be concerned about the broader aims of education. They may therefore prove unwilling to fund the development of materials other than that exemplified by the bauxite kit. Additionally, small businesses who might wish to canvass an alternative view of Australian free-enterprise are unlikely to have the funding or time available to mount developments such as that between Q.E.T.A. and Comalco.

2. Despite the development of a radical perspective in both economics and geography, as testified by the work of people such as Wheelwright (1965, 1978) and Peet (1977), syllabusses still tend to reflect an orthodox free-enterprise approach to economics. The consequent ideological bias in content orientation ensures that teachers accept materials that are complimentary to the operations of private capital and enterprise rather than those that might appear to threaten the economic status quo.

3. Although the positivist model is now widely disparaged if not rejected by most educators, materials that reflect the attitudes and values of our society are typically seen as objective - a realistic assessment of "what is". As a result teachers may readily assume that the materials such as those in the bauxite kit are objective and unbiased, particularly as the dissemination of factual information is still frequently perceived as value free.

All these factors indicate that a symbiotic relationship exists between economics - as it is currently taught - and the business community. It seems likely therefore that the ideological component of the bauxite kit may be paralleled in other joint productions of teachers and the corporate sector.

Clearly, it is time we reminded ourselves of the power of schools and teachers to legitimise the activities of certain groups. Educational institutions are, after all, socially approved agencies for the dissemination of information. If we, as teachers, provide information complimentary to one group and not others, or perpetuate myths or stereotypes, we are severely limiting the opportunities of our students to develop decision making skills and make meaningful social choices.

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BIAS IN GEOGRAPHY TEXTBOOKS: A REVIEW

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ABSTRACT

Errors of omission and commission, stereotyping and over-simplification distort the presentation of people, processes and events in geography textbooks. The resultant image of the world presented to students is biased by sexism, racism, ageism, ideology, cultural and class supremacy and nationalism. This literature review traces the origins of research in the English language into textbook bias in the United States and the United Kingdom. The major publications on geography textbook bias in the United Kingdom by Boden, Hicks, Gill, a team co-ordinated by Kent, and the Centre for World Development Education are reviewed. An example of the presentation of South Africa in *Patterns in Geography Two* *(Rice, 1975) and* *Geographical Patterns* *(Rice and Hinds, 1978) is analyzed in depth using concerns expressed by Wright and Pardey (1982) to illustrate the forms bias can take. A co-ordinated review program of bias in Australian-published Years 8-10 geography textbooks is proposed.*

> Education materials teach far more than information and a way of learning. In subtle - often unconscious - ways, the tone and development of the content and the illustrations foster in a learner positive and negative attitudes about self, race, religion, regions, sex, ethnic and social class groups, occupations, life expectations and life chances. Inadvertant bias, as often the result of omission as commission, can influence the impact of educational programs.
>
> (Ginn and Company, 1973)

The response of China and the two Koreas to the 1982 guidelines on the presentation of Japanese history issued by the Japanese Education Ministry to textbook publishers remind us of the potential for bias in any teaching materials and of the strength of reaction possible from groups of people who feel slighted by such bias. It must be admitted that the displaced guidelines for publishers also were biased, conditioned as they were by the American influence in the post-1945 Education Ministry and the normalization of relations with China in 1972. However, the 1982 guidelines also presented a distorted view of events. It is interesting to note the way language has been used to alter the version of history to be presented to Japanese school students. Publishers have been instructed to describe the 1931 invasion of Manchuria as a "North China advance" and to blame the slaughter of 200,000 people in 1937 during the Rape of Nanking on "resistance by the Chinese army", not "extreme callousness on the part of the Japanese Army" as in the original guidelines. The deportation of several million Koreans from their villages to forced labour camps is now to be described as "the implementation of the national mobilization order for Korea".

Similar distortions are no doubt used by the press and government in all nations to present a favourable view of their past to their citizens and students. For example, the authors of a study of the treatment of the Vietnam War in United States history and Social Study textbooks conclude that

> "American high school students, teachers and parents could read these textbooks without considering the possibility that they lived in a nation that had committed the most blatant act of aggression since the Nazi invasions of World War II."
> (Griffin & Marciano, 1979)

Further studies by Fitzgerald (1979), Fleming (1982), Fleming and Nurse (1982) and Heath (1981), who interestingly used cartographic information in National Geographic magazine articles on Vietnam, confirm this view.

A description of reforms in Soviet education between 1914 and 1918 by Piskunov and Dneprov (1978) illustrates how textbook publication and syllabus modification, among other techniques, were used to convert teachers, students and their families to the Soviet cause. However, the point to be made from these Japanese, Russian and American examples is not that governments, publishers and textbook writers have a vested interest in presenting a biased view of events in student textbooks, but that bias does exist and that geography teachers in Australia need to be aware of the bias, unintentional or otherwise, in the textbooks and other resources they use.

BIAS EXPOSED

Textbooks do more than provide information. As Milner, the author of Children and Race (Milner, 1975) reminds us, "whether fact or fiction, 'information' is seldom conveyed in a social vacuum."

Deliberately or otherwise, writers and their publishing support staff, including editors, graphic artists, cartographers and photographic librarians, convey their own attitudes on a variety of issues to the reader, even when they are not part of the intent or theme of the book. Zimet (1976) notes that there is a "particular danger" in this for textbook writers when they attempt to simplify issues, processes, persons and events for young audiences. The act of simplification is not neutral. It is one of selection and overgeneralization, and bias and stereotyping in many forms are often the result

It is no longer a matter of debate whether bias and prejudice exist in Australia today (Grassby, 1982a). Demands from many sources for social equity regardless of race, religion, sex, age or disability are evidence of this. We barely need the testimony of the victims of prejudice, our own experiences, or the research results of social psychologists to remind us of its effects. Unfortunately, schools have failed to combat prejudice in many of its forms. Indeed, much evidence suggests that schools often have served to actively promote it. Biased teaching materials and textbooks are a significant factor in this. One cause of this is the *oversimplification and sterotyping* described above. A second is the *predominant assimilationist ideology* which de-emphasizes cultural differences and encourages the writers of textbooks to romanticize about reality, avoid controversial ones, and to trivialise social equity through lip-service to small "l" liberalism. A third cause of bias is *poor quality research by authors* which often results in the uncritical use of data drawn from limited and often highly suspect sources. A fourth cause which must be mentioned is the *deliberate and conscious intent to promote misinformation* and biased thinking for ideological, sexist or racist ends which has been detected in textbooks for a variety of subjects.

Research in North America in the 1960s and 1970s kindled interest in textbook bias in social studies. It grew out of the Black civil liberties movement and has expanded to include bias against all ethnic groups, and other forms of bias such as sexism, ageism and socio-political ideology. It has spread in the English language literature to the United Kingdom where educators concerned with children's literature and reading have provided the lead. There, it has encouraged the formation of groups such as Teachers against Racism and the Children's Rights Workshop. Lately, geographical educators in the United Kingdom have drawn attention to explicit bias in geography textbooks and Schools Council kits in Third World and urban studies. In

Australia, a concern for the fair treatment of minority groups has resulted in the publication of a report on cultural bias in primary textbooks by the Commissioner for Community Relations (Grassby, 1982b).

A special issue of Social Education, the journal of the National Council for Social Studies, in April 1969 was instrumental in developing the consciousness of social science educators to the issues involved in biased teaching materials. Joyce, the editor of the issue, quoted Rogers and Muessig (1963) who noted that:

> "Too many texts are filled with slanted 'facts', stereotypes, provincial and ethocentric attitudes, and superficial, utopian discussions which skim over conditions as they actually exist in life today..... Perusing a number of books, one gets the impression that all Americans live on wide, shady streets in clean suburban areas, occupy white Cape Cod style houses, drive new automobiles, have two children (a boy and a girl, of course) and own a dog."

Articles by Banks (1969) and Harris (1969) reported on the results of their detailed content analysis of racism in social studies textbooks. Gibson (1969) summarized such findings well in her phrase, the "three Ds". She noted:

> "Instead of facts, our children, black and white, have been indoctorinated with the 'three Ds': Distortion, Deletion and Denial.... The 'three Ds' have enforced the myth of white superiority and have provided a basis for the perpetuation of racism."

Further studies such as The Image of the Middle East in Secondary School Textbooks for the Middle East Studies Association of North America (Griswold, 1975), Asia in American Textbooks by the Asia Society (1976), Africa in US Teaching Materials for the Afro-American Trust (Hall, 1976), and Teaching Prejudice by the Ontario Institute for Studies in Education (McDiarmid and Pratt, 1971) confirmed Gibson's (1969) claim that most social science textbooks, including geography ones, distort the image of "non-WASPs" (and here I am thinking of Bowen's (1981) acronym of "White Anglo-dominant Sexist Positivists"), delete reference to their positive contributions to world society, and have thereby denied "non-WASPs" of self esteem, and 'WASPs' of knowledge of, and respect for, cultures other than their own. The resulting ignorance often has been the catalyst for racism. As Grassby noted in his foreword to the Australian report on cultural bias in primary textbooks:

> "The experience of my Office in combating racial discrimination in Australia during the past six years is that a great deal of the prejudice and bigotry which leads to acts of discrimination is generated in the schools of the nation.
>
> The arises from ethocentrism among teachers, prejudice among students, and teaching materials which are often inaccurate or biased, or both."
>
> (Grassby, 1982b).

The attention of geography teachers had been drawn to this parlous state in 1972 by Kevin Blachford who was concerned particularly about the promotion of notions of cultural supremacy and nationalism in geography. He wrote:

> ....schools have promoted and sanctified nationalism.... each child is the property of a particular nation... indoctorinated with notions of the superiority of his land and culture.... (given) criteria to distringuish THEM from US... (and urged) to defend the people and characteristics of his own land.
>
> (Blachford 1972).

AUSTRALIA'S NEED

A computer search for similar reports on any social science teaching in Australia revealed only *one* other study, that by Noronha (1978,79) on the presentation of Indian culture and history in Australian textbooks. Noronha (1979) concluded that

> ... the kind of material on India disseminated in current history textbooks leaves much to be desired in the way of accuracy and objectivity. *This position is contrary to that advocated by curriculum statements on the subject*.... As such, the value of these books as adequate teaching material comes into question. If such is the case where India is concerned, what is the situation regarding other countries and peoples? Doubt is cast on the validity of all such materials in our textbooks. *In a pluralist society such as Australia is, perhaps a thorough investigation into our teaching materials is in order*. (emphasis added)

History educators and others, who are perhaps more attuned to the effects of racism and prejudice than their geography colleages, have taken up Noronha's challenge. (The fact I can say this without too much fear of challenge surely is an indictment of our past concepts of worthwhile content in geography courses!) Hutton (1982) for example, has evaluated the effects of conservative nationalist ideology on the teaching of Australian history, particularly in relation to teaching materials on Aborigines, World War II, the Vietnam War and the peace movement. Williamson (1982) has investigated the capitalist bias in economics material and Gilbert (1982) the presentation of person-society relationships in social studies textbooks. Maher has looked at the ideological bias in biology teaching and environmental education. I suggest it is time geographical educators involved themselves in this issue and redressed the often quite biased geography textbooks being published in Australia. This was the plea issued by Leach in the United Kingdom in 1973:

> A major task facing....geographers must be to replace the textbooks responsible, which have been found wanting (and) can only be rewritten by geographers. These books come from within the discipline and should be rejected by its practitioners themselves. (Leach, 1973)

We would be doing no more than joining the mainstream of geographical and geographical education thought in doing so. Developments in geography during the 1970s have done much to awaken us to the selective nature of most of our explanatory economic and urban models. Their western ethnocentrism and capitalist assumptions were exposed by Harvey (1973) and others (see Peet, 1977) a decade ago. Geographical educators, too, from Wolforth (1976) who urged us to expose our students to the "muddle in the models", through Storm (1971, 1978) who lamented the "smugly eurocentric world view" in geography textbooks; Marsden (1976) who exposed the values bias in many simulation games; and Donnelly (1982) and Sibley (1982) who spoke at the 1982 Australian Geography Teachers' Association Conference on this issue, have legitimized a concern for a reflective review of where geography teaching has come thus far. Perhaps, such a review is a necessary resting point at this moment for geography curriculum developers in Australia who are more noted for their enthusiastic curriculum advances than their enthusiasm for curriculum evaluation.

A nationwide investigation of the state of geography teaching is necessary at the moment. It is a research project the Australian Geographical Education Research Association would do well to promote. One part of that research ought to include a stocktaking of the quality of the teaching resources used in schools. If the experience with social science textbooks in North America and geography textbooks in the United Kingdom is anything to go by, one of the most important services geographical educators can provide teachers might lie in the development of a set of guidelines for identifying textbook bias, teaching with them, and developing critical thinking skills in students. Suggestions on some of these are made in the conclusion to this paper.

BIAS IN GEOGRAPHY TEXTBOOKS IN THE UNITED KINGDOM

Some directions for research in this area may be found in five reports on bias in geography teaching materials in the United Kingdom. They represent work by Philip Boden (1977), the Centre for World Development Education (1979), Dave Hicks (1980 a,b,c,d; 1981 a,b,c; undated), Dawn Gill (1980, 1981, 1982a) and a team co-ordinated by Ashley Kent (1982). Brief remarks on the aims, research approach and findings of each of these illustrates the wide scope of research on geography textbook bias awaiting us in Australia.

Promoting International Understanding Through Textbooks (Boden)

Boden's study reviewed the potential for promoting international understanding through history, geography and social studies school textbooks in seven countries: France, Federal Republic of Germany, India, Japan, Kenya, United Kingdom and Venezuela (Boden, 1979). It was sponsored by the Georg Eckert Institute for International Textbook Research under contract from UNESCO. Qualitative content analysis was used to consider the levels of accuracy, adequacy and sensitivity in 70 textbooks (10 from each country). The guidelines for the reviewers are worthy of quotation in full in order to define these terms:

> *Accuracy* means that incidents and events should be presented without distortion (whether deliberate or unintentional) and in perspective (historical and geographical).
>
> *Adequacy* means that the selection and treatment of topics should be based on a well-balanced sense of their relative importance in a setting embracing the whole world and the whole of human history.
>
> *Sensitivity* means the capacity for appreciating the best and most significant in the culture and history of other countries, whether such aspects have their origins within or without the area concerned.

The statement of criteria for reviewers continued:

> The task of the experts responsible for examining the textbooks will be to pick out, in particular -
>
> - wrong facts, erroneous ideas, controversial interpretations;
> - tendentious presentation which may give an unfair and derogatory image of a people or a civilisation and hence embitter relations between different countries;
> - development of arguments unfitted, because of their length, to the importance of the subject being dealt with, whether, for example it has been studied at too great a length or touched upon too briefly; omissions. (Boden, 1977)

The major findings in the study which took three years to complete was that, despite excellent technical quality of textbook production in terms of format, layout and printing, several major problems existed. A criticism of interest to geography teachers was the preponderance of the following in most textbooks in all seven countries:

1. Inaccurate statements in the form of
   (a) out of date facts;
   (b) error as a result of simplification;
   (c) undue or insufficient treatment of certain events, places and people;
   (d) incorrect use of terminology;
   (e) defective maps;
   (f) poor photographs.
2. Omission of basic and essential historical and geographical information on a country (as deemed by the evaluator from that country).
3. Misleading interpretations and opinions caused by
   (a) inaccurate use of terms;
   (b) emotive use of descriptive terms;
   (c) presentation of unsubstantiated comments and opinions;
   (d) selection of data and opinion from limited sources.

Boden provides examples from the reviews to illustrate teach of these areas of concern in school textbooks. Suggestions are also made for authors on how to avoid factual inaccuracies and oversimplification and to redress imbalances and misinterpretations. Interestingly, all of these relate to the breadth and depth of research needed by prospective authors.

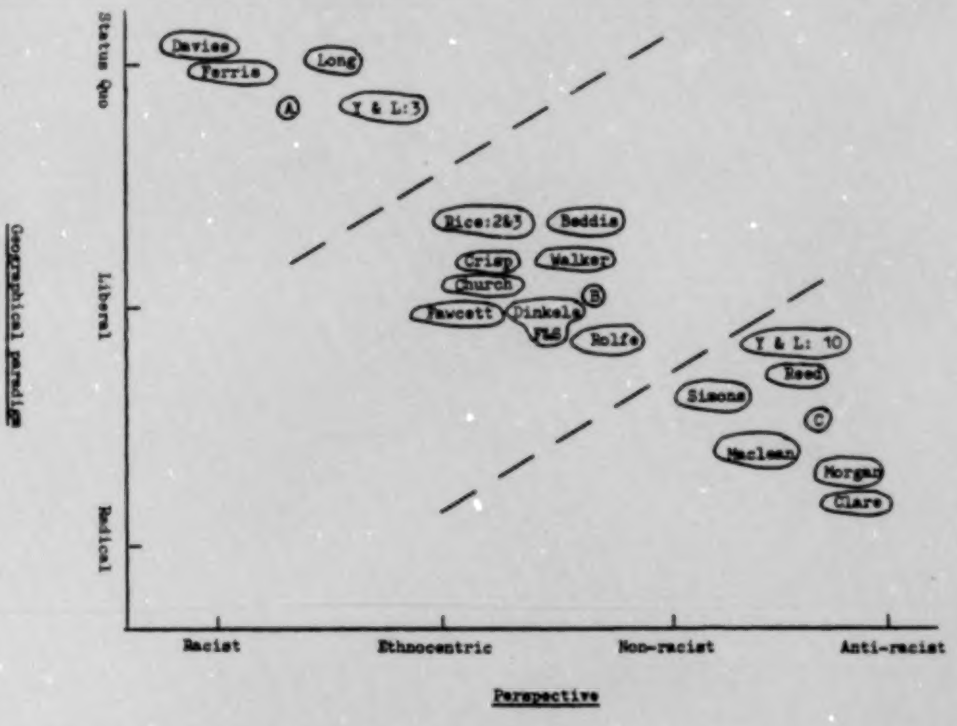
The Changing World and Geography (CWDE)

The Centre for World Development Education (CWDE) in London operates through a number of study/action groups. Its Geography Study/Action Group has produced a review of the treatment of Third World issues titled The Changing World and Geography (Centre for World Development Education 1979). A checklist for identifying the quality of the treatment of Third World issues was developed and used by nineteen people to review two or three books each. The checklist is an excellent guide for teachers to aid in the analysis of their teaching materials. Unfortunately, as Gill (1982b) points out, the evaluations are unreliable through two aspects of the research method used. Firstly, each book was reviewed by only one person and the contrasting ideological perspectives on development held by the nineteen reviews were not balanced by any moderation process. Secondly, the reviewers were asked to give "scores" to each book on the elements in the checklist. These scores are presented in a matrix and totalled. One would have thought that much more depth of comment was possible with each reviewer responsible for so few books. The result of these two methodological flaws is that Crawford's Developing World Book 2 (1976) scored equal points as Stuart's The Unequal Third (1977)! Anyone familiar with these two books will know how ludicrous that is with the continual disparagement of Third World peoples in the entire Developing World series (see Hicks, 1980d). Nevertheless, the philosophy of development education expoused by Michael Storm in the Introduction is valuable reading for all geography teachers; and the checklist (if not the matrix) is a useful guide in textbook analysis.

Images of the World in Geography Textbooks (Hicks)

Dave Hicks is known for his work on the World Studies Project and for his concern for a global perspective in the curriculum and geography's potential contribution to it (Hicks, 1979a, 1979b). The results of his doctoral work at the University of Lancaster on Textbook Imperialism : A Study of Ethnocentric Bias in Textbooks with Particular Reference to Geography (Hicks, 1980c) have been diffused in journals, newspapers, monographs and seminars (Hicks 1980 a,b,d; 1981 a,b,c, ; undated). Briefly, his research was in two parts, one on an analysis of 20 commonly used textbooks on Third World themes and the other on an analysis of the threatment of multicultural Britain in 14 textbooks used in the United Kingdom.

His research has enabled him to produce three categories of textbooks in relation to the treatment of Third World issues and peoples. These are identified by positions on two continua: the geographical paradigm used by the authors (radical - liberal - status quo) and the degree of racism evidenced in the publication. The analyses of the books was done by an exhaustive set of criteria developed in part from the World Council of Churches' publication, The Start of the Pen : Racism in Children's Books (Prieswerk, 1980). The resulting three categories are depicted in Figure 1. It reveals that the status quo/racist books are in the minority. A similarly small number are of sufficient sensitivity to help redress racist beliefs. In the words of Hicks, the majority of books, the ones in central cluster in Figure 1,



Ranking	Author(s)	Title	Publisher	Date	% of Schools
1	Long & Roberson	World Problems	Hodder	1969/77	44
2=	Clare	The Third World	Macdonald	1974	36
2=	Rolfe et al.	Contrasts in Development	O.U.P.	1975	36
4	Rice	Patterns in Geog:2	Longman	1975	26
5	Fawcett	Spotlight on World Problems	Macmillan	1975	25
6	Rice	Patterns in Geog:1	Longman	1978	24
7	Ferris & Toyne	World Problems	Hulton	1970	19
8=	Beddis	Africa, L. America...	Hodder	1968/73	18
8=	Young & Lowry	3: Regions of the World	Arnold	1962/78	18
8=	Young & Lowry	10:The World-Systematic	Arnold	1979	18
11	Dinkele et al.	Farming	Harrap	1976	17
12	Morgan	Population and Food Supply	Collins	1969	16
13	Davies	Problems Around Us	Holmes McDougall	1970	14
14	Crisp	Different Worlds	Nelson	1975	13
15	Church & Ford	Focus on World Problems	Nelson	1971/75	12
16=	Dinkele et al.	Settlement & Services	Harrap	1976	11
16=	Maclean & Thompson	Problems of our Planet	Holmes McDougall	1977	11
16=	Simons	Poverty & Wealth in Cities & Villages	O.U.P.	1972	11
16=	Walker	Environmental Problems	Blackwell	1973	11
20	Reed	The Developing World	Bell & Hyman	1979	9

Figure 1: Three categories of Third World textbooks used in United Kingdom geography classes.

(Hicks, 1980b; 1981 b,c)

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> are often ethocentric in approach, and though well-meaning in their investigation of Third World issues contribute little to multicultural understanding. Whilst they appear to offer attractive explanations about poverty, development, world food etc. they are often divorced from the reality they purport to represent. (Hicks, 1981b).

The overall messages about the Third World common to the textbooks in Clusters A and B are that:

1. poverty is due to inbuilt obstacles and/or chance;
2. Rostow's model is a valid one and if Third World countries do the right things, "take-off" will come;
3. overpopulation is caused by too many mouths to feed in the Third World, not overconsumption of resources in the First World;
4. peasant farmers need education and everyone needs help;
5. colonialism was the best thing to happen to countries in the Third World (if colonialism is mentioned at all);
6. minorities do not exist or need help in coping (Hicks, 1980a).

Hicks found similarly alarming results in his analysis of the treatment of multi-ethnic Britain in 14 geography textbooks in the British Isles. He found that most ignored that aspect of British geography despite the variety of ethnic origins of students in British classrooms. Controversial issues were either ignored, trivialized, romanticized, and generally presented from only one viewpoint.

Third World and Urban Issues (Gill)

Dawn Gill's initial research was on the ideological orientation of urban geography in inner-London schools in relation to the various approaches to urban geography developed in the 1970s (Gill, 1980). She has extended this research to include the treatment of Third World issues as well. In particular, she has found examination syllabuses and the Geography for the Young School Leaver Project to be deficient through a biased explanation of issues such as world "problems", Negroes (not Whites) and crime in US cities, the life of Bantu workers in South Africa, squatter settlements in the Third World, Commonwealth citizens in Britain, and the role of government and corporation policy on changing industrial patterns and resultant unemployment.

She concludes that the requirements of syllabuses at CSE and GCE O-level in London are loaded against student understanding of the processes at work in capitalist cities:

> A city which has a poor inner area surrounded by relatively well-off suburbs is in itself a spatial form which should be studied by pupils. Geographers are satisfied with generalizations. All cities are like this. What they should be doing is explaining why. The city is a built form which reflects social inequality. Students should be encouraged to ask how social inequality came into being and how it is perpetuated, if they are to understand the spatial patterns within a capitalist city. (Gill, 1982a).

She provides glaring examples of how some of the Geography for the Young School Leaver Project materials pointedly avoid such issues, and encourage a benign acceptance of oversimplified and often inaccurate descriptions. A reply by Beddis (1981) to these charges clearly places the Geography for the Young School Leaver Project in Cluster B on Hicks' graph (Figure 1).

An Expanded Range of Inquiry (Kent)

The four British studies reviewed thus far have exposed the cultural and ideological orientations of geography textbooks and teaching materials that have produced inaccuracies and bias through ethnocentricism, cultural supremacy and racism. A team of geographical educators in the United Kingdom co-ordinated by Ashley Kent sought to expand the range of inquiry into textbook bias after the 1981 annual conference of the University Department of Education geography tutors in Swansea. The publication, Bias in Geographical Eucation (Kent, 1982), is the result of their endeavours. The four chapters include a consideration of sexism in geography (Bale), bias in the regional examples and scale of sample studies used by geography teachers (Kent), bias in the interpretation of photographs (Wiegand), and cartographic and statistical bias in textbooks (Wright and Pardey). These four papers, in the words of Kent, are "a tentative introduction to a topic which clearly deserves fuller consideration by those involved in geographical education" (Kent, 1982). The papers by Bale, Kent and Wiegand are introductions to the issues of sexist, regional and photographic bias. They define terms and review the literature, setting the scene for (hopefully) more empirical inquiry, such as that by Moore (1978) on sexism in social studies text books. It would have been useful if the publication had done the same for ageism in geography teaching, surely an issue worthy of inquiry, given the rapid "greying" of the world's population. (See Council on Inter-racial Books for Children (1976) for an example of research on ageism in children's books.)

AN EXAMPLE OF TEXTBOOK BIAS

Wright and Pardey provide the only empirical work in the Kent publication. Taking the teaching of South Africa as an example, they pursue an area of bias (the presentation of Africa in the geography curriculum) that Wright has exposed on earlier occasions (Wright, 1978; 1979).

The verbal and photographic content of several books on South Africa were reviewed by Wright and Pardey in 1981 (Wright and Pardey, 1981). In the Kent publication, they turned their attention to exposing examples of bias in the statistics and statistical maps in one popular and attractive textbook used in Second Form in the United Kingdom. The book is Patterns in Geography Two by Rice (1975). The book is characterized by many full-colour photographs and a great variety of student-centred activities. Indeed, the book is so popular that it was reprinted five times between 1975 and 1980 and has been revised for Australian schools in a special edition (Rice and Hinds, 1978). Despite this popularity, the two chapters (of a total of 11) on South Africa reveal gross inaccuracies and distortions in the presentation of life, mining and urban patterns in that country. These are Chapters 7 and 8. Looking at the statistics and statistical maps alone, Wright and Pardey (1982) record:

1. The theme of the first two pages of Chapter 7 is the racial composition of South Africa. Yet unlike seven other Forms 1-3 books reviewed, and which explore the same theme, neither Rice (1975) nor Rice and Hinds (1978) present a map of the allocation of land to the different races.
2. By contrast, their first map presents the Afrikaner version of the settling of South Africa. The map falsely records the Bantu southward migration stopping in northern Transvaal and the Voortrekkers thereby occupying an empty land.
3. A table of the population of South Africa by racial groupings contains inaccurate data. For example, Rice (1975) claims the 1970 population of Bantu people to be 12,750,000 (68% of total population) compared to the 15,058,000 (70% of total population) as the 1970 census of South Africa reveals. By contrast, the figures provided by Rice for Whites in 1970 is 3,600,000 (19%) when the census reveals a white population of 3,751,000 (18%).
4. A second map plots the distribution of South Africa's population with different symbols for each ethnic group. The map does not contain a

scale, but cartographic convention would lead one to believe each symbol, regardless of race, would represent the same number of people. But this is not so, for each Bantu symbol represents 106,000 people while each White symbol represents only 65,000 people (Rice, 1975).

5. The boundaries of South Africa presented in the map are incomplete and show South Africa to include parts of Mozambique and the entire area of two independent countries, Lesotho and Swaziland. When the area and population of the latter two are considered, the cartographic errors are compounded. Each Bantu symbol then represents 120,000 people, while each White symbol represents only 67,000 people (Rice, 1975).

6. Such cartographic inaccuracies lead pupils to interpret that Bantus constitute 55% of the population and Whites 29% (Rice, 1975).

7. The Australia edition of the book (Rice and Hinds, 1978) updates the population figures to 1973, but presents the identical population distribution map as in Rice (1975). Calculations similar to those done by Wright and Pardey (1982) for Rice (1975) reveal that each Bantu symbol now represents 129,000 people (or 142,000 if the areas of Lesotho and Swaziland are excluded) compared to only 32,000 people per White symbol (or 71,000 people per White symbol if the areas of Lesotho and Swaziland are excluded). Based on these figures, the racial composition of South Africa is distorted to present students with an interpretation of Whites constituting 44.4% of the South African population and Bantus 43.3%.

8. Another exercise requires students to deduce the racial composition of the South African population in three squares over the locations of Cape Town, Johannesberg and Durban. These three sites are not named; students could be forgiven for believing them to be randomly selected sites. Whatever the authors' intentions, the students' calculations reveal the racial composition of the population of South Africa in these areas to be:

   10% Bantu and 30% White in and around Capetown;
   40% Bantu and 30% White in and around Durban;
   50% Bantu and 45% White in and around Johannesberg.

   Each set of figures seriously overstates the White population and understates the Bantu population of South Africa as a whole. Moreover, the geo-political structures that lead to White dominance of the cities are not mentioned, let alone explained, analyzed or held up for values inquiry.

9. A series of map and photograph interpretation exercises on Johannesberg emphasize the morphology and functions of a European city. The only urban problem mentioned is freeway congestion! Soweto, the daily train journeys from Soweto to Johannesberg, the blight of the "illegals", and the Black economy are not mentioned.

10. The remaining maps and tables in the two chapters emphasize the White economy - mining, steel and car manufacturing, urbanisation and retailing. The exploitation of Bantu workers in such activities is not mentioned. The high technology and capital inputs of such activities is alien to the life in the Homelands or the Bantu townships, features of the settlement pattern of South Africa which are not mentioned in either book.

These 10 points do not list all the distortions in the two chapters on South Africa! Others may be found in the oversimplified treatment of the car industry (progressing because of government tax policies, not cheap labour) and the role of multinational corporations in the South African economy. The only question asked of students in relation to the latter is to list the origins and products of a list of 35 companies! Nowhere at all in the two chapters is *apartheid* discussed. In fact, the issue is trivialized by a glib instruction to -

> 1.5 Heading: South Africa's population.
>
> Write a short essay summarizing the origins, number and distribution of the population. Comment on the varied languages. Explain what apartheid means.

or shown to be an acceptable means of production efficiency by instructions to -

> 4.2 c. Describe the annual migration of workers to the mines (as shown in a flow map of the number and direction of worker travel).
>
> d. With reference to the graph, state why the gold mines are not short of labour.
>
> e. State why the mines are able to employ Bantu workers so cheaply.
>
> (Rice and Hinds, 1978)

The human geography of South Africa, along with its citizens, obviously awaits decolonizing! (Crush, Reitsma and Rogerson, 1982.)

The distortions in Patterns in Geography Two and Geographical Patterns highlight distortion and bias caused by both omission and commission in geography books. The omission of attention to important issues denies pupils the opportunity to consider, analyze and come to reasoned conclusions on many important questions of social justice. Claims that such issues are "too difficult" or "too controversial" for young students appear lame when the chapters in question also include the study of overseas investment, multinational corporations, theoretical urban models and von Thunen land use patterns. The "sins of commission" in these chapters, together with these omissions, are sufficient to cause one to be reasonably sure they were either deliberate attempts to deceive pupils or the result of unforgiveably poor authorial research and editing.

CONCLUSION

It is the duty of researchers who expose bias in textbooks to provide teachers and students with ways of coping with the distorted views presented. The guidelines on textbook use from the Manitoba Department of Education (1980) has a concluding section which offers guidelines for eliminating sex, race and class bias. A short paper from Henrikson and Patton (1976) contains a number of sample lessons designed to develop skills of discrimination using biased textbook and film resources. Moore (1975) presents activities with a similar goal based upon two history textbooks. Wright and Pardey (1982) are true to this tradition and suggest seven activities for teachers and students to identify the areas of bias and distortion in Rice (1975). They include: statistical exercises, atlas work, the study of the same topic in different textbooks, verifying historical claims in history textbooks, and class discussion.

The Kent publication Bias in Geographical Education (Kent, 1982) resulted from a meeting similar to this one. A group of geographical educators realized the importance of the issue and co-ordinated their research. Geography teaching in Australia would be served if a co-ordinated investigation of bias in geography textbooks resulted from this meeting of the Australian Geographical Education Research Association. It would be one way of illustrating the relevance and usefulness of research to classroom teaching.

Issues for investigation might include:

1. The portrayal of Aborigines in geography textbooks.
2. The portrayal of multi-ethnic Australia in geography textbooks.
3. The portrayal of women in geography textbooks.
4. The portrayal of the aged in geography textbooks.
5. The portrayal of disabled people in geography textbooks.
6. The portrayal of different races, especially in Third World countries, and of minority groups in the First and Second Worlds.
7. The nature of explanation in geography textbooks, that is do socio-economic and political processes receive equal treatment as environmental and perceptual explanations of phenomena and patterns?
8. The nature of development and underdevelopment processes in geography textbooks.
9. The ideological assumptions behind the selection of topics to present and issues to pursue (or ignore) in geography textbooks.
10. Indications of cultural supremacy and nationalism in geography textbooks.
11. The regional and scale of study bias in the areas and case studies presented in geography textbooks.

Geography teachers in Australia have a preference for using Australian-produced textbooks. Major publishing companies such as Longman Cheshire, The Macmillan Company of Australia, Heinemann Educational Books, Thomas Nelson and Sons and Jacaranda Wiley provide almost all the textbooks used in Years 8-10 geography in this country. They require examination for bias in the selection of content, the themes presented, the perpsective taken and the means used to present it through omissions, inaccurate or distorted claims, and misleading and unrepresentative photographs, maps, tables, graphs and case studies.

Geographical educators interested in further research in this area may go in any number of directions. The variety of themes to pursue, the range of publications, and the myriad forms that bias takes (see Boden, 1977; Roberts, 1975) allow for this. However, a co-ordinated research program requires limits to such variety. Essentially, we can go either of two ways after a list of 10 to 15 most commonly used textbooks are determined. A questionnaire issued to 10 geography teachers in each State of Australia in mid-1982 revealed these to include:

Sale, Friedman and Wilson. *Our Changing World Series*. Longman

Marriot, Palmer and Thompson. *Man and his World Series*. Macmillan

Brereton, Gallagher, Sinclair and Wilson. *A Geographer's World Series*. Longman.

Millikin and Courtney. *Explorations in Geography Series*. Longman.

(The results of the questionnaire still requires verification from publishers' sales figures.)

The alternatives before us are for interested researchers either

(i) to select a textbook or textbook series and review it in the light of the 11 issues listed above; or

(ii) to select an issue or form of bias and investigate it across the range of textbooks.

Interested people are invited to attend a special interest group meeting at this conference to discuss these alternatives and begin planning a co-ordinated program of textbook research for Australian geography teaching.

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TEACHING GEOGRAPHY TO LESS-ABLE 11-14 YEAR OLDS

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ABSTRACT

This paper reports on some recent work carried out by one of the Working Groups of the British Geographical Association during 1981 and 1982.

The Working Group on New Techniques and Methods in Teaching Geography undertook a survey of teaching geography to less able 11-14 year olds in a selection of British schools. Graham Corney and Eleanor Rawling, Secretary and Chairperson respectively of the Working Group, summarise important aspects of the survey in this paper. The four main sections deal with (1) the aims and objectives o fthe survey, (2) the survey design, implementation, and methods of analysis, (3) selected findings and (4) issues identified and recommendations for further work.

Whilst responsibility for the accuracy and main emphases of the paper rest with the authors, the planning and execution of the survey and the analysis of findings were full Working Group activities. The other full members of the Group during the 1981-82 period were: Neville Grenyer, Paul Gwilliam, David Hall, Bob Hammond, John Hancock, Andrew Herdman, Tony Pearce, and John Tresadern.

The full report 'Teaching Geography to Less-Able 11-14 Year Olds; Report of a Survey' is now available in published form from the Geographical Association, Sheffield, U.K.

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Introduction

The teaching of geography to pupils of below average ability is an issue of increasing concern to geography teachers and others involved in geographical education. This concern is reflected in a number of ways; one of these is the frequency with which the British Geographical Association is asked to provide advice and practical guidance.

Partly in response to this situation, the Association's Education Standing Committee requested in 1980 that the Working Group on New Techniques and Methods should explore the issue and suggest ways in which the Association could be of help to geography teachers.

The Working Group, in accepting this invitation, decided that an important first task was to collect information about teaching geography to less able pupils. From this information base, appropriate research and development work could then be undertaken.

Accordingly, the Group conducted a survey during 1981. This paper provides a summary of aspects of that survey under four headings:

1. Aims and Objectives of the Survey.
2. Survey Design, Implementation and Methods of Analysis.
3. Selected Findings
4. Issues Identified and Recommendations For Development Work.

1. AIMS AND OBJECTIVES OF THE SURVEY

The overall aim of the survey, as stated in the Introduction, was to collect information as a basis for further work. This aim was expanded by a set of more detailed objectives:

1. to clarify the meaning of the term "less able" as used by classroom teachers, and to identify methods used to define these pupils;
2. to identify the particular learning problems experienced by less able pupils as apparent in their work in geography, and to recognise the implications of these for geography teaching;

3. to identify the particular characteristics of geography which provide both problems and potential in its use as a medium for educating less able pupils;
4. to gain information about organisational provision within the geography department for less able pupils and to collect some examples of successful teaching strategies;
5. to examine the criteria used by teachers to judge the success of teaching strategies carried out with less able pupils;
6. to make recommendations in relation to those issues and those teaching strategies which would merit further research and/or development work.

2. SURVEY DESIGN, IMPLEMENTATION AND METHODS OF ANALYSIS

(i) Survey Design

In planning to implement the stated objectives, certain considerations had to be taken into account. These influenced the choice of survey methods and the identification of survey schools.

One consideration was that a balance had to be drawn. There was the need to make respectable both the survey and the analysis of findings in terms of the conventions of an action research project, and also a desire to provide information and practical assistance to teachers as quickly as possible. Another consideration was that the work had to be within the Group's limited resources of time, people and money.

Consequently, three major decisions were taken affecting the nature of the survey.

The first was to focus on the 11-14 age range. It was felt that this was an important and clearly identifiable target group. The great majority of pupils in this age range study geography in some form.

The second decision was to collect information from teachers by interview. It was felt that personal contact with teachers was more likely to provide the detailed information required than the more mechanical, less personalised task of completing a questionnaire. In addition, use of an interview would allow greater flexibility.

Questions which had been identified in advance could be asked, but it would also be possible to take account of individual situations. Thus, valuable points which might not have been predicted could be followed up, and there would be opportunity for teachers to talk about issues which they felt to be important. It was planned to supplement the detailed information arising from the interviews with basic data collected through completion of a brief questionnaire.

The third decision was closely related to the decision to interview, and this was to adopt a case-study approach and so to focus on a limited number of schools. Selection of schools thus became of fundamental importance so that a representative range of schools would be included. Initially, Group members proposed schools where personal contact suggested that an interview would be both valuable and practicable. Background information about twenty two such schools was obtained, and the details were analysed both qualitatively and quantitatively. Twelve schools were eventually selected on the basis of general location, catchment area characteristics, size,and aspects of school organisation.

The schools are located in several areas of England and Wales, and their catchment areas include inner city, suburban, and rural environments. Sizes range from 375 to 1750 pupils, and school types include a middle school and comprehensive schools catering for 11-16 and 11-18 years. In some schools, geography is taught to classes with pupils from the full ability range; in others, to classes with a wide spread of pupil abilities but where remedial pupils are withdrawn; and in others, teaching groups for geography are composed on the basis of banding or setting by ability. Geography sometimes appears as a separate subject on the timetable; in other schools it forms a component of an integrated studies or humanities course.

Further details of the case study schools are given in Figure 1.

Having decided on the nature of the survey and selected the schools which would be involved, attention was given to developing and carrying out the interview. Several members of the Group wished to interview teachers in the case study schools, and a team of six was

Figure 1

School	Total Nos.	Nos. 11/12 yrs	Type of School	Catchment Area	Place of Geography			Nos of Hrs. Devoted to Geog.			Organisⁿ of Teaching Groups			Teachers used		
					11/12yrs	12/13yrs	13/14yrs	11/12yrs	12/13yrs	13/14yrs	11/12yrs	12/13yrs	13/14yrs	11/12yrs	12/13yrs	13/14yrs
1	1750	80	Comp (M) 11-18	Inner Urban	S(Co)	S(Co)	S(Co)	2.0	1.5	2.0	M	St	St	1FS	2FS	6FS
2	1534	260	Comp (M) 11-18	Rural and Commuter	S(Co)	S(Co)	S(Co)	1.5	1.5	1.5	M(R) B	B	B	3F + 3FS	3F + 2FS	3F + 1FS
3	1400	250	Comp (M) 11-18	Urban C19th Industrial	S	S	S	1.3	1.3	2.0	M(R)	M(R)	M(R)	1F	3F	3F
4	1340	230	Comp (M) 11-18	Urban Newtown	S(Co)	S(Co)	S(Co)	1.5	1.5	1.5	B	B	B	3F + 3FS	3F	3F
5	1300	210	Comp (B) 11-[illegible]	Inner Urban (Social Priority)	S(Co)	S(Co)	S(Co)	0.5	1.5 - 2.0	2.0	M(R)	B	B	6F	5F	5F
6	1765	221	Comp (M) 11-16	Rural Commuter	S(Co)	S(Co)	S(Co)	1.2	1.7	1.2	M(R)	S	S	2F, 1P + 1FS	3F, 1P + 2FS	3F
7	1100	250	Comp (M) 11-18	Suburban	S(Co)	S(Co)	S(Co)	1.6	1.6	1.6	M(R)	M	S	5F	5F	5F
8	935	132	Comp (G) 11-18	Inner Urban	S(Co)	S(Co)	S(Co)	1.2	1.2	1.2	M	M	M	3F, 1P + 1FS	3F +	3F
9	900	n.a.	Comp (M) 11-16	Urban C19th Industrial	S(Co)	S(Co)	S(Co)	2.5	2.5	2.5	M	M	M	3F, 1P + 1FS	4F	4F
10	900	172	Comp (M) 11-16	Small Market Town	C(Co)	S(Co)	S(O)	4.5*	1.5	1.5	M*	M	S	3F + 3FS	3F	3F
11	555	105	Comp (M) 11-16	Suburban and Inner City	C(Co)	S(Co)	S(Co)	2.5*	1.5	1.5	M	M	M	1F + 3FS	1F + 2FS	1F + 2FS
12	376	94	Middle (M) 9-13	Urban Univ.Town	C(Co)	S(Co)	n.a.	3.0*	1.0	n.a.	M	S	n.a.	4FS	1PS	n.a.

Key to Figure 1 THE SURVEY SCHOOLS

N.B. Information pertains to the 1981/82 academic year

KEY TO ABBREVIATIONS:

PLACE OF GEOGRAPHY

S = as a separate subject
C = combined or integrated
(Co) = compulsory for all pupils
(O) = optional

ORGANISATION OF TEACHING GROUPS

M = mixed ability
M(R) = mixed ability but remedial withdrawn
B = classes mixed within broad ability banding
S = teaching groups set according to ability in geography
St = streaming exists for year group as a whole

TEACHERS USED

F = full time geography teacher
P = part time geography teacher
FS = full time teacher shared with another subject department
PS = part time teacher shared with another subject department

* symbol relates to Combined Studies not just Geography

set up.

In order to ensure compatability of data collected by different interviewers, a semi-structured interview schedule was prepared. The main interview themes were prepared in an initial planning session (Figure 2). Detailed questions under each heading were subsequently identified through further discussions, consultation with advisers, and piloting with teachers. The short questionnaire was also prepared and trialled in schools.

Initial contact was made with the Heads of Geography in the case study schools to ensure their willingness to participate in the survey. This was followed by a formal letter, explaining details of the survey procedure. The questionnaire was enclosed with this letter and schools were asked to complete this prior to interview.

The whole of this planning process occupied the period April - September 1981.

(ii) Implementation

Interviews took place in September and October 1981. They were held either in school, or in a location where interruptions seemed less likely. The time taken varied according to individual circumstances, ranging from about forty five minutes to almost two hours. Some interviews were tape-recorded and subsequently transcribed; in others, notes were made by the interviewer and subsequently written in report form.

A full return was obtained. Each school provided a completed questionnaire and enabled the Head of Geography to participate in the interview. At some schools, another member of the Department was also interviewed and the responses have been valuable to the Group, although not used in the official report.

(iii) Methods of Analysis

Analysis took place in a series of stages over the period November 1981 - June 1982.

Figure 2

INTERVIEW SCHEDULE: MAIN HEADINGS

1. Definition of the less able pupil.
2. General learning problems noticed in geography lessons.
3. Characteristics about geography which cause problems for pupils.
4. Special provision in the geography department for less able pupils.
5. Judging success in teaching the less able.
6. Special provision outside the geography department for less able pupils.
7. Examples of teaching strategies and materials.

Initial processing involved the completion of collation sheets so that transcript data and field notes could be summarised for each school.

Subsequently, the data was collated by question rather than by school. This re-working process allowed a clarification of responses and helped in the identification of trends and ideas.

The stage of preliminary data analysis was followed by a stage in which the Group attempted interpretation of the findings. Thus key issues which seemed to arise from the data were summarised. Based on these issues, recommendations for further work were made. This process was considerably aided by consultations both with the teachers initially interviewed and with other educational specialists and advisers.

The Final Report of the Survey was completed in July 1982. In the Report, findings derived directly from the interview data are presented as far as possible without interpretation or evaluation. The Group's interpretations and recommendations are set out in a separate section.

3. SELECTED FINDINGS

Findings related to the key interview themes are fully presented in the main Report.

In order to provide in this paper something of the character of the interviews which took place and of the findings received, some results relating to one interview section are presented below. The section chosen is that of 'the characteristics of geography providing problems or potential for pupils'.

Questions prepared for use with each interview theme followed a common pattern. An initial open question was posed so that teachers were given the opportunity to present their own views of the situation. This was then followed up by a series of probing questions aimed at eliciting information about specific points. Finally, with most themes, a last question again gave teachers an opportunity to pursue issues or raise new points not included by the interviewer.

The initial open question with regard to the characteristics of geography drew this response from one teacher:

> "Well - I think there are a lot of very positive things about the sort of geography we teach. But I'd say that in the past three years there are the kinds of problems that I've mentioned before - like the difficulty of seeing relationships between ideas, and like problems with scale, direction and transferring information - for example, particularly using atlases. I mean, they're quite good at transferring information from the board into their books, but when it comes to picking up data from one source like an atlas, for example, and transferring it on to, say, a base map, they can experience problems. I think that it's a problem of spatial ability, spatial organisation really."

These points were also mentioned by other teachers, so that in summary, it was possible for the Group to identify that two categories of problem caused by the nature of the subject were (a) the development of geographical skills and (b) the understanding of geographical facts and ideas. In addition, most teachers drew attention at some stage to the problems which both they and their pupils found in dealing with attitudes and values. The Group thus identified attitudes, values and the affective domain as a third area of concern.

The characteristics of geography which made it a particularly effective medium for teaching less able pupils were commented on by some teachers, although responses were fewer on this aspect. Fieldwork, mapwork and drawing tasks were mentioned as having potential, as were the opportunities provided in geography to refer to foreign countries or to focus on local topics and issues.

In response to the more probing questions, many interesting points were recorded. For instance, in talking about fieldwork, teachers revealed three very different sets of attitudes.

One was that fieldwork was not carried out with less able pupils. Another was that where fieldwork was carried out, less able pupils experienced difficulties, even in simple tasks such as observation and recording information. The third was that fieldwork had great potential with less able pupils. Motivation was normally assured, simple tasks like observation and recording could be readily undertaken, and geographical ideas could be illustrated in an enjoyable way. One teacher commented:

> "the children that I've found most difficult to deal with in the classroom for a whole host of reasons are often superb in the field. They've come into their own. I think it's probably much more interesting and it appears more relevant than reading something from a book, and that catches their imagination much more, particularly if they have problems with reading ..... they feel more confident in their ability and perform better."

In response to the open question concluding this section of the interview on the characteristics of geography, several teachers re-emphasised points already made. It is, perhaps, interesting to end this part of the paper with the comments of one teacher which related to the general potential of geography:

> "I just think that it's a fascinating subject, and I would say that most of the Department feel that,and that our enthusiasm comes over to the kids. It is a very popular subject with all the kids in this school."

4. ISSUES IDENTIFIED AND RECOMMENDATIONS FOR FURTHER WORK

The key issues identified from the survey findings are itemised in Figure 3. Related to each of the issues are recommendations from the Group for further research and/or development work.

A summary of these issues and of the related recommendations is given below.

(i) Definition of Less Able Pupils

The survey revealed considerable variation, amongst teachers and between schools, in the criteria used for identifying less able pupils. Even where reliance was placed on tests, a variety of these were in use, covering a range of skills. More often it seemed that teachers used a range of personal criteria. Estimates of the proportion of less able in a total year group population thus varied

Figure 3

KEY ISSUES

(i) Definition of Less Able

(ii) Aspects of General Learning

- reading, writing and number work
- oral work
- limited concentration spans
- difficulties with generalisation
- appreciating alternative viewpoints

(iii) Characteristics of Geography

- use and interpretation of maps
- fieldwork
- understanding key geographical ideas

(iv) Teaching Strategies

- resource based enquiry
- drama and creative work
- structured worksheets
- role play and simulation
- using audio-visual aids

(v) Organisation of Teaching Groups

(vi) Judging Success

(vii) Inter-Departmental Cooperation

widely and so did strategies put forward for dealing with them.

The Group is of the opinion that clarification of the criteria by which less able pupils are identified is an important topic for development work. The preparation of suitable approaches to teaching those with learning problems would be considerably aided if teachers were better informed in this way. Further development work would necessarily involve consultations with specialist advisers and educational bodies.

(ii) Aspects of General Learning

Reading, writing and number work were the basic skills most frequently mentioned by teachers as providing problems, and so the development of these skills is put forward by the Group as one key issue in this area.

Another issue concerns oral work. Teachers' opinions about oral work varied considerably: some saw this as another area of difficulty, while some teachers emphasised its potential.

Other issues related to three general learning characteristics which teachers saw as being characteristic of less able pupils - limited concentration spans, difficulties experienced with generalisation, and difficulties in appreciating alternative viewpoints.

A final issue in this area was the contribution of work in geography to the broader social education of pupils.

In all these issues, there is a close relationship between the way in which general skills can be used to promote learning in geography, and the means by which geography can be used to promote the development of general skills.

Accordingly the Group recommends that research and development work might usefully focus on investigating (a) the potential of geography as a medium for a wide range of skill development and (b) the degree to which progress in geography is dependent on these skills. Part of this work might include the gathering and dissemination of information about good teaching practice.

(iii) Characteristics of Geography

Two aspects of geographical work frequently mentioned by teachers were mapwork and fieldwork. However, while the use and interpretation of maps was generally seen as problematic with less able pupils, fieldwork was considered by some teachers to provide major difficulties, and by others to present opportunities for stimulating and valuable work.

The Group recommends, therefore, that there is a need for further investigation of the opportunities and constraints involved in both using maps and in carrying out fieldwork, and for an attempt to plan out some appropriate sequenced learning activities in these areas.

Another issue relating to the characteristics of geography concerns pupil difficulties in understanding key geographical ideas. This was emphasised by many teachers, and it was suggested that modern conceptually-based approaches to geography are contributing to make the subject less accessible to slow learners. The Group feels that there is scope for further work here, investigating the way in which children develop key ideas in geography and the extent to which choice of topic and/or teaching strategy might assist their learning.

(iv) Teaching Strategies

The interview responses revealed that there are several teaching strategies which may have considerable potential with less able pupils, but which are under-utilised at present. These include resource-based enquiry, drama and creative work, use of structured worksheets, role-play and simulation and use of audio-visual aids. Each of these strategies has been identified as a key issue.

The Group recommends that further work should be carried out in relation to some, at least, of these strategies. The work would clearly relate to the development of general learning skills ((ii) above) and might include the preparation of exemplar materials or guidelines.

(v) Organisation of Teaching Groups

The Survey revealed that less able pupils were taught in a variety of teaching group situations. It seems that an issue worthy of further study is the extent to which different organisational structures help or hinder the effective operation of teaching strategies in geography with less able pupils.

The Group recommends that some form of study be undertaken to elucidate these points. It is aware that such a study would need to operate in conjunction with other work on teaching strategies. It may also be the case that investigations would need to be conducted on a large scale and over a long time period in order to obtain meaningful results.

(vi) Judging Success

There seemed to be no common approach to judging success with less able pupils. Some teachers relied heavily on formal testing; others made extensive use of personal criteria related, for instance, to pupil behaviour or enthusiasm. It seems then that criteria and methods for judging success together comprise another issue worthy of further consideration.

The Group believes that a necessary part of any work carried out to identify suitable teaching topics or strategies should be the clarification of successful evaluation methods, linked closely to specified learning objectives. It therefore recommends that this work should occur in conjunction with other appropriate studies.

(vii) Inter-Departmental Cooperation

The Group has recognised inter-departmental cooperation as a crucial issue. It was clear from the Survey that it was rare for different subject teachers to meet in order to discuss the needs of these pupils, or for them to make any attempt at joint planning of learning experiences.

It seems to the Group that opportunities are being missed here. Accordingly, it is recommended that once some of the initial subject-based work has been undertaken in geography, it would be valuable to make approaches to other subject teachers. Suggestions might be prepared for cooperation with other subject areas, forming the basis for such discussions. These might also assist geography teachers to play a positive role in developing school curriculum policy as a whole.

Conclusion

In the preceding sections of this paper, we have summarised four important aspects of a Survey recently carried out into the teaching of geography to less able pupils aged 11-14 in England and Wales.

Because of the nature of the survey and, in particular, its reliance on case study data, the findings and recommendations which have been outlined can only relate to those case studies and can not be seen as being representative of an overall situation. However, the Group suggests that the issues identified and the recommendations put forward are worthy of general consideration.

The Group is also aware that all the issues are inter-related and that advances in one area may be dependent upon progress in another. For this reason, although the Group itself will focus on a limited number of items for further work, it has recommended to the British Geographical Association that action be initiated on all these issues during the 1982/83 academic year.

The Group would welcome hearing of the results of any similar work undertaken in Australia on these themes.

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ATTITUDES AND APPROACHES TO TEACHING LESS ABLE PUPILS IN YEAR 8 GEOGRAPHY IN QUEENSLAND

John Fien, Rodney Gerber and Peter Wilson

ABSTRACT

The departmental heads of thirty-four geography departments in Queensland secondary schools were surveyed and interviewed about the teaching of less able pupils in their geography classes. Information was sought in seven areas: the way the less able pupil is defined and identified, their learning problems in geography, the features of geography which cause problems for pupils, special provisions made in geography departments for less able pupils, ways of judging their success in geography, special provision made outside the geography department for less able pupils, and successful teaching strategies for them in geography. The results of this investigation are reported here along with several suggestions for reinforcing existing successful practices, and several recommendations for reform.

This study is a replication of a research project on teaching less able pupils in the lower forms in English secondary schools co-ordinated by the New Techniques and Methods Working Group (chaired by Ms E. Rawling), of the Geographical Association. That study is reported in a paper Corney and Rawling tabled at this Conference.

Three points may be noted about this paper by way of introduction:

1. The theme of teaching less able pupils focuses on a problem that has been uppermost in the minds of geography teachers for many years, but which has not received due attention from researchers and curriculum developers in geography until quite recently, the GYSL Project not

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withstanding. Yet, in the past three years, one can note papers, booklets and chapters on the theme by Pick and Renwick (1979; 1983, forthcoming), Boardman (1981), Dilkes (1982), Butler and Simmons (1982) and Corney and Rawling (1982).

2. The study is a replication, something relatively rare in the literature of geographical, and even social education. It is one small step towards a pattern of replicative studies that Herman (1980) claims is necessary for the development of a sound theoretical base for classroom practice.
3. Much of the data collection was done by final year teacher education students in the geography program at Brisbane College of Advanced Education, Kelvin Grove Campus. They were required to use a structured interview schedule to discuss attitudes and approaches to less able pupils with a geography teacher as part of their study of catering for individual differences in the classroom. The interview and analysis of the replies were also used to promote the idea of the "teacher-as-researcher" through action research which has been a feature of the Kelvin Grove geography teacher training course for several years (Wilson, 1980, forthcoming; Wilson and Godwin, 1981; Wilson and Widt, 1982).

AIMS OF THE STUDY

The study was a survey of Queensland geography teachers' attitudes and approaches to their less able pupils. The focus was on pupils in Year 8, the first year of secondary education in Queensland, only, compared to the wider Forms 1 - 3 focus of the English study. However, it sought to obtain information on the same seven areas explored in the English study:

1. Definition of the less able pupil.
2. General learning problems noticed in geography lessons.
3. Characteristics about geography which cause problems for pupils.
4. Special provision in the geography department for less able pupils.
5. Judging success in the teaching the less able.
6. Special provision outside the geography department for less able pupils.
7. Examples of teaching strategies and materials.

The survey was in two parts: a preliminary questionnaire followed by a structured interview with the head of department or co-ordinator of geography in the school. (The interview was conducted with a senior geography teacher in three schools due to the unavailability of the head of department.)

THE SCHOOLS, CLASSES, AND TEACHERS IN THE STUDY

Thirty-four schools participated in the study. They included twenty state high schools and seven private schools in the Brisbane metropolitan area and seven state high schools in non-metropolitan areas of Queensland. Geography was taught to a total of 282 Year 8 classes in these schools. Geography was taught as a discrete discipline - based study in all but seven of these schools. Five taught geography in an Integrated Studies course in conjunction with history, one in a largely sociology orientated Study of Society course, and one in a humanities course that included English, history and geography.

Predominantly, geography was taught for three periods a week, with a mode period length of 40 minutes. More periods per week were allocated to the integrated studies courses, but no indication was given on the amount of time allocated to geography. Only one school reported that geography was not fairly treated in its integrated course.

The 282 Year 8 classes were taught by a total of 154 teachers. These represented a range of experienced (over three years teaching) and not-so-experienced teachers, and a range of specialist and non-specialist geography teachers (Table 1). The alarming feature of this table is the 17.5 percent of experienced and the 7 percent of not-so-experienced teachers who have no background in geography whatsoever, but are teaching it in Year 8.

The other disturbing feature is the situation of 154 teachers taking 282 Year 8 classes, an average of 1.2 classes each, and few teachers specialising in teaching Year 8 geography. However, it is pleasing to see that 50 percent of the teachers in the sample are experienced specialist geography teachers.

TABLE 1: THE TEACHERS IN THE STUDY

Claimed Degree of Specialism	Years of Teaching Experience				Total	
	3 yrs or less		More than 3 yrs			
	N	%	N	%	N	%
Specialist geography teacher	11	7.1	77	50.0	88	57.1
"Second teaching area" geography teacher	10	6.5	18	11.7	28	18.2
No geography background	11	7.1	27	17.6	38	24.7
TOTAL	32	20.7	122	79.3	154	100.0

Year 8 geography classes were mixed ability classes in twenty-four of the thrity-four schools (70.6%). An additional six schools (17.7%) had mixed ability classes but had a policy of withdrawing less able pupils, and providing them with specialist attention in a range of subjects, including geography. Only four schools (11.7%) streamed classes on ability, chiefly in English and mathematics (Table 2). This pattern contrasts with the Year 9 - 10 situation in most schools in which geography tended to be taught to academically streamed classes only. Table 3 illustrates the range of ability group organisation for Years 9 - 10 geography classes.

It is important to note in Table 3, that the 7 schools in which geography is compulsory in Year 9 or Years 9 - 10 are the 7 private schools who have a "grammar school" curriculum and tend to enrol few less able pupils. In the 13 schools in which geography may be selected from a 'smorgasbord' of subjects, geography is generally on a "line" with the social science subjects for the non-academic students (Citizenship Education and Social Studies). This reinforces the pattern in Queensland in which geography is not taught to any but the academically "top" students in Years 9 - 10.

Year 8 is a different situation where geography is taught to all students, mostly in mixed-ability classes (Table 2). How do geography teachers recognise their less able pupils? What are their attitudes towards them? What approaches are used to teach them? These were the questions at the centre of this study.

ANALYSIS OF REPLIES

Thirty-four teachers (or groups of teachers) took part in the interviews. In general, each interview provided between five and ten typewritten pages of transcript. The following is a synthesis of the transcripts and is presented under the seven headings outlined in the "Aim of the Study".

1. DEFINITION OF THE LESS ABLE PUPIL

Teachers used a wide range of definitions to define their less able pupils. The responses ranged from short, definitive answers based on standardised tests -

> The official one first of all would be the I.Q. ratings and also, the standardised TOLA scores from primary school

- to longer, more generalised comments based upon the teacher's subjective view -

> Teachers make mental notes of who are the "good" kids and

TABLE 2: THE ORGANISATION FOR TEACHING GROUPS IN YEAR 8 GEOGRAPHY

Ability Grouping	N	%
Teaching groups in geography contain pupils of the full range of ability	24	70.6
Teaching groups in geography contain pupils of a wide range of ability, but less able pupils are withdrawn for special teaching	6	17.7
Teaching groups in geography are determined according to an overall streaming policy in Year 8	4	11.7
TOTAL	34	100.0

TABLE 3: ABILITY GROUPS IN YEARS 9 - 10 GEOGRAPHY

Subject Selection Policy	N	%
The subject choices offered to pupils mean that only the most able study geography	13	38.3
Any pupils may select geography from a 'smorgasbord' of subjects, but not all do	13	38.3
All pupils study geography in Year 9	4	11.7
All pupils study geography in Years 9 and 10	3	8.8
The school policy forces the more able pupils to study geography in Years 9 - 10	1	2.9
TOTAL	34	100.0

> who are the "bad" kids. The criteria used to judge may be things like the way students respond in class or the standard of work handed in.

Two state high school teachers objected to the categorisation of students as less able with responses such as -

> Experience would indicate that it is most unwise to categorise students according to ability in Year 8, because, all too frequently, initial impressions can mis-interpret different states of maturity, a shy nature or an attitude to work.
>
> Further, if students are categorised as "less able" then there is often a "self-fulfilling prophecy" coming into force where the student will react as less than able.

> My experience is that very few students could, or indeed should, be classed as "less able" and a conscious effort should be made by the teacher to encourage all students to achieve. Being slow at reading, counting or even reasoning doesn't deny the student the ability to participate in geography lessons (as it might in more abstract subjects).

One teacher at a private girls' school took a divergent view towards the interview and said -

> I will not be able to answer any of the questions on the interview sheet as they are not relevant to this school. There are no less able pupils in geography as every student is capable of coping with the work.

A synthesis of the criteria used to define a less able pupil is provided in a summarised form in Table 4.

TABLE 4: CRITERIA USED TO DEFINE A LESS ABLE PUPIL

Criteria	Frequency
Reading Ability	15
Language Level	12
Primary School Standardised Tests	9
Primary School Results	7
Mathematics Ability	7
Overall Geographic Ability	7
Difficulty with High School Work	6
High School Results	5
Lack of Motivation	4
Low Concentration Span	4
Physical/Emotional Problems	2
Lack of Skills	2
Year 8 Entry Test	1
Knowledge Recall	1
Peer Group	1
Writing Ability	1
Information from Other Teachers	1
Lack of Travel Opportunities	1

The main categories of criteria centred on the students' ability to read and their level of language development in relation to textbooks, worksheets or notes on the blackboard. Several teachers said that geography was centred on the written word (as was high school in general) and that students who could not read had little hope with the subject (or with high school). The other main criterion used was the Standardised TOLA Tests which are tests of learning abilities, study skills, mathematical achievement, reading vocabulary, reading comprehension, and are given to all Queensland Year 7 children in October of each year.

Other factors relating to the identification of the less able pupils which emerged from teachers' comments include:

1. Most teachers do make a conscious effort to identify the less able pupils in their classes.
2. However, the majority of pupils are in mixed ability classes so little can be/is done for the less able.
3. In general, teachers thought there were about ten to fifteen percent of less able pupils in each year's intake. This amounts to three to five pupils in each class of thirty.
4. No system-wide policy with regard to less able pupils is outlined by state, catholic or independant school systems.
5. School policies with regard to less able pupils range from very good involving either special classes or specialists teachers to no policy at all.

2. GENERAL LEARNING PROBLEMS NOTICED IN GEOGRAPHY LESSONS

All teachers were conscious of the less able pupil as an individual in their classrooms, or as a small group in a specialised class. They were able to identify some twenty-three learning problems they associated with the less able pupils. These problems are shown in Table 5.

The list is quite comprehensive and gives a good feeling for the learning problems that a less able pupil is faced with. The serious problems associated with reading which were outlined in the previous section are again high on the list, but the main problem centred on the pupil's ability to concentrate for a period of time. One teacher at a State High School in the country summed up the feelings of many teachers -

> .... But mainly, the kid who can't concentrate - that's the main problem - a child who has an attention span of 3½ seconds, and you do get them.

Another group of problems high on the list centred on the pupil's intellectual

TABLE 5: LEARNING PROBLEMS NOTICED IN GEOGRAPHY LESSONS

Problem	Frequency
Low concentration span	24
Reading difficulties	23
Inability to retain/recall information	18
Inability to use maps and diagrams	16
Inability to work with numbers	15
Writing difficulties	14
Inability to understand concepts	11
Slow rate of work	8
Speaking difficulties	7
Behaviour	6
Poor attendance	6
Lack of interest (motivation)	5
Doesn't bring equipment to class	4
Poor skill development in fieldwork	4
Inability to think abstractly	3
Overall Language	3
Inability to follow simple instructions/explorations	3
Poor performance in tests	2
Poor listening	2
Lack of confidence	1
Lack of neatness and organisation	1
Unable to work independently	1
Frustration	1

and work study skills. Teachers frequently mentioned that the less able pupil has difficulty remembering information from the beginning of the period to the end, let alone from one week to the next. Pupils had great difficulty with the graphic areas of geography (especially topographic maps), the numeracy of "new geography", and writing in notebooks and evaluation exercises.

3. CHARACTERISTICS ABOUT GEOGRAPHY WHICH CAUSE PROBLEMS FOR PUPILS

The geography teachers in the study quickly recognised that the nature of their discipline had many characteristics which caused serious problems for the less able pupil these major problems are outlined in Table 6.

TABLE 6: CHARACTERISTICS OF GEOGRAPHY WHICH CAUSE PROBLEMS FOR LESS ABLE PUPILS

Problem	Frequency
Using contour maps	18
Understanding abstract concepts	12
Vocabulary	11
Practical and field work	10
Using small scale maps	8
Reading skills	4
Writing skills	4
Research skills	4
Matching photos to maps	3
Scale	3
Atlas skills	2
Map symbols	2
Ability to generalise	2
Skill acquisition	2
Lack of interest	2
Latitude and longitude	1
Reading instruments	1
Drawing ability	1
Numeracy	1
Simulation games	1
Preparation in Primary School	1

The pupils' ability to read and their level of language development, which were outlined under Tables 4 and 5 are again high on the list. However, two other abilities rate higher than the problem of vocabulary associated with geography. Aspects of mapping tend to dominate the list with the "old favourite" of using contour maps at the top of the list (again!). This reflects a belief held by most geography teachers that mapping is a central aspect of the discipline, but also shows that geography teachers fail to appreciate the difficulty of introducing mapping skills to pupils in the early years of high school. Two of the authors of this paper have written extensively over the past years on the difficulty of introducing maps and mapping skills to pupils in schools. The results in this table show that most geography teachers would do well to read the most recent statement by

Gerber and Wilson on this issue (Gerber and Wilson, 1983).

In contrast to the amount of data offered in Table 6, geography teachers could offer only a few characteristics of the subject that make geography an effective medium for teaching the less able. These characteristics are shown in Table 7.

TABLE 7: CHARACTERISTICS OF GEOGRAPHY THAT MAKE IT AN EFFECTIVE MEDIUM FOR TEACHING THE LESS ABLE

Characteristic	Frequency
Use of direct observation	13
Use of audio-visual materials	11
Use of instruments	4
Use of questionnaires	2
Emphasis on Local Area	2
Use of simulations	1
Use of colouring-in	1

This table reflects a belief held by most geography teachers that field work is a central aspect of the discipline. The use of concrete learning experiences based on direct observation with use of instruments especially within the local area was suggested by most teachers. This table correlates closely with Table 10 which shows the range of teaching strategies that geography teachers have found useful with less able pupils. However, Tables 7 and 10 seem at odds with Table 8 which suggests that little real provision is made for the less able pupil in the geography classroom. They are taught the same topics, with the same teaching strategies and resources as all other pupils, and are assessed with the same tests.

This table clearly reflects the pattern that emerged in Tables 2 and 4, which was:

1. Over seventy percent (70.6%) of the teaching groups in Year 8 geography contain pupils comprising the full range of abilities.
2. In general, less able pupils do not study geography in Years 9 - 10.
3. There is no standardised education authority policy with regard to less able pupils.
4. School policies with regard to the less able are quite diverse.

TABLE 8: SPECIAL PROVISION IN THE GEOGRAPHY DEPARTMENT FOR LESS ABLE PUPILS

	Overall Response	Frequency	%
Is special provision made?	Yes	20	58.8
	No	14	41.2

Provision Made	Frequency	
Pupil Organisation		
Ability grouping	5	
Withdrawal	2	
Smaller class size	2	
No special pupil organisation	16	73.5%
No comment given	9	
Teaching Strategies		
Concrete learning experiences	7	
Use of remedial teacher	6	
Teacher empathy	5	
Slower work pace	2	
Easier exercises	1	
No special teaching strategies	10	38.2%
No comment given	3	
Selection of Topics		
Same topics - less depth	6	
Different topics	5	
No special topics	23	67.6%
Resources Used		
Different	7	
Same - used differently	2	
No special resources	19	73.5%
No comment given	6	
Monitoring of Pupils Work		
Parental contact	4	
Closer monitoring	1	
No special monitoring	16	85.3%
No comment given	13	
Assessment Policy		
Different tests	5	
Same tests - marked differently	1	
Same tests	17	82.4%
No comment given	11	

5. Most schools and subject masters leave the responsibility for the less able pupils to the individual geography teacher.

Almost half the geography departments made no provision for the teaching of their less able pupils. Some departments allowed for ability grouping within the classroom. The teaching strategies tended to be the same for the less able as for the rest of the mixed ability group. Only a few schools made use of a remedial or resource teacher, if one was available. To repeat, the majority of the less able pupils were taught the same topics with the same resources and also sat for the same tests as all other pupils.

5. JUDGING THE SUCCESS OF TEACHING THE LESS ABLE

The geography teachers surveyed were in accord in their ways of judging their success in teaching the less able pupils. These are shown in Table 9.

TABLE 9: JUDGING SUCCESS IN TEACHING THE LESS ABLE

Criteria	Frequency
Use of exam/test scores	25
Discussion within the department	20
Discussion with parents	15
Discussion with pupils	14
Discussion with remedial teacher	11
Classroom atmosphere	2
Confusion on pupils faces	2
Pupil enjoyment	1
Intuition	1

The information provided in Table 8 showed that 82.35% of all geography teachers evaluate the less able pupil in the same way as all other ability groups. So, the fact that geography teachers use exams and test scores as their main criteria for judging their success in teaching the less able is quite consistent. The other chief area of judging success is by discussion with a range of people including other members of the geography department, parents, the pupils themselves and the remedial or resource teacher, if one is available to them.

6. SPECIAL PROVISION OUTSIDE THE GEOGRAPHY DEPARTMENT FOR LESS ABLE PUPILS

Twenty-two of the thirty-four schools interviewed (64.7%) stated that there was provision for helping the less able pupil outside the geography department. In fact, much more appears to be done for the less able pupil outside the geography area than within. A school may have a guidance officer either full or part time, a resource teacher and/or a remedial teacher. This group of people help to identify the less able pupils as they enter high school, then work closely with the English department usually until the pupils leave the school. Work centres on special help for reading and language development. However, many geography teachers saw this work outside of their responsibility, or claimed that the pressure of work did not allow them to do very much for the less able.

7. EXAMPLES OF TEACHING STRATEGIES AND MATERIALS

The previous sections have shown that geography teachers and departments are able to identify the less able pupils in their classrooms, but from that point on little is done to cater for their individual or group needs. With this in mind, Table 10 which outlines the strategies that teachers have found successful in teaching the less able, appears at odds with the previous sections. Perhaps, Table 10 contains the strategies teachers would use if time would allow a range of provisions to be made for their less able pupils. Alternatively, perhaps teachers were being modest in their responses reported in Tables 8 and 9 because they felt they were not doing enough for their less able pupils.

The most important strategies suggested in Table 10 are consistent with the characteristics of geography outlined in Table 7, that teachers felt made the subject an effective medium for teaching the less able pupil. These are the use of a wide range of audio-visual materials and approaches with a great deal of practical work both inside and outside the classroom, and the use of the local area for outdoor learning. However, as many teachers said, these strategies should be used by any teacher of geography with any ability level of pupil.

TABLE 10: SUCCESSFUL STRATEGIES FOR TEACHING THE LESS ABLE PUPIL

Strategy	Frequency
Audio-visual approaches	11
Practical work	10
Outdoor learning	9
Lower level reading materials	6
Work suited to ability	4
Role play	4
Slower pace	3
Clearer instructions	3
Repetition	3
More blackboard use	3
Team teaching	3
Inquiry	3
Friendly approach	3
Group work	2
Variety in each lesson	2
Language	2
Praise	2
Interesting content	1
Project work	1
Cartoons	1
Familiar examples	1
Local school contest	1

CURRICULUM IMPLICATIONS

The previous seven sections have synthesised the views expressed in interviews in thirty-four Queensland schools with regard to teaching geography to less able pupils in Year 8. At least seven implications for the geographical education of less able pupils emerge from this study. These are:

1. Geography teachers need a clear understanding of the nature of the less able pupil.
2. Schools should establish a clear, practicable policy for teaching less able pupils.
3. Geography teachers need to become aware of and be able to implement a range of strategies suitable for learning in mixed ability classes.

4. Geography teachers need to become aware of and be able to implement a range of strategies suitable for learning by less able pupils.
5. Geography teachers need to become astute selectors and developers of appropriate resources for teaching geography to less able pupils.
6. Geography teachers need practice in the construction of appropriate forms of assessment which reflect the capabilities of less able pupils.
7. Geography teachers need to undertake professional development activities to broaden their understanding of the less able pupil and to develop suitable learning experiences in geography for these pupils.

1. GEOGRAPHY TEACHERS NEED A CLEAR UNDERSTANDING OF THE NATURE OF THE LESS ABLE PUPIL

Geography teachers mentioned a wide range of criteria of less able pupils and a variety of learning problems exhibited by these pupils. The emphases on reading and language deficiencies, as well as a weakness in number skills, are similar to those reported by Pick and Renwick (1983) in a survey of less able pupils in northern England. In addition, Pick and Renwick report a strong concern for these pupils' writing deficiency. These criteria, together with the pupils' low concentration span and limited ability to reason, begin to paint a picture of the less able geography pupil. The similarities of the characteristics of less able pupils in Queensland and northern England suggests some basis for generalising about these pupils. No doubt, the surveys which have been conducted so far have identified some of the attributes of less able pupils. However, more geography teachers need to reflect on their pupils' abilities and performances to reinforce or extend the learner characteristics identified so far. This need for geography teachers to identify the nature of less able pupils is bound in the idea of a teacher diagnosing how pupils learn and devising attractive learning activities suitable to each pupil.

2. SCHOOLS SHOULD ESTABLISH A CLEAR, PRACTICABLE POLICY FOR TEACHING LESS ABLE PUPILS

Each school implements a range of subject curriculums in a distinctive social and environmental context. In Queensland, the school context is more important because of the current emphasis on school-based curriculum development. In addition, the crucial criteria for identifying less able pupils in geography, e.g. reading ability, language level, reasoning ability and low concentration span, are likely to be crucial criteria for diagnosing less able pupils in other school subjects. It would be sensible for each school to draw together the views of all teaching and learning areas to generalise on the nature of less able pupils. Such an exercise could well indicate the magnitude of the less able pupil population in the school. If this population is substantial then the school administration ought to consider the development of a clear, practicable policy to maximise the learning by less able pupils. The existence of such a policy may be useful for alerting incoming geography teachers to the existence of less able pupils in the school. As well, this policy should prompt the school administration and teachers to prepare to teach less able pupils effectively so that these pupils enjoy learning in geography and achieve to their own abilities. The preparation phase to cope with less able pupils involves the careful consideration of appealing strategies for promoting effective learning in geography.

3. GEOGRAPHY TEACHERS NEED TO BECOME AWARE OF AND BE ABLE TO IMPLEMENT A RANGE OF STRATEGIES SUITABLE FOR LEARNING IN MIXED ABILITY CLASSES

Most of the geography teachers in this study reported that their less able pupils are taught in mixed ability classes. There are administrative, educational and psychological arguments for maintaining mixed ability classes in schools. However, as the Department of Education and Science in the United Kingdom (1978) stated, there is limited evidence of mixed ability teaching. The authors suspect that the situation is similar in Australia. Lidstone (1983) clarifies the concept of mixed ability teaching and suggests that five principles are crucial to planning and teaching in geography. These principles are:

(a) Much work by students will be undertaken on an individual basis.
(b) Pupils will not be labelled by ability nor will they be placed in competition against one another.
(c) Groups of similar specific abilities may be constructed for specific purposes.
(d) Pupils of markedly different specific abilities will be required to work together to a common end for some of the time.
(e) Learning experiences will compromise as wide a variety of resources and activities as possible.

Lidstone illustrates these five principles of mixed ability teaching with an example of a unit on modern Ghana (Figure 1).

How many geography teachers in Australia, of the many who have mixed ability classes, can say that they practise the above principles and strategies to maximise learning in geography?

Route	Conceptual Content	Learning Experiences
ROUTE ONE (Less able students)	1. Differences in living standards between Ghana and Great Britain. 2. Subsistence agriculture in North Ghana including: (a) the farmer's year, (b) seasonal controls on farming activities (c) advantages and disadvantages of self-sufficiency, (d) social organisation and welfare through the extended family system, (e) migration of young and ambitious people to urban areas.	1. Reading and comprehension (short passages); making notes following a tight structure. 2. Simple picture and map interpretation. 3. Line sketching.
ROUTE TWO (Ordinary students)	1. Everything on Route One, plus: 2. The system of rotational bush fallowing and variations in intensity of farming with distance from the farmhouse added to Sections 2a and 2b of Route One. 3. National patterns of land use. 4. Problems of cattle farming, e.g. disease and climate variability.	1. Everything on Route One with reading extended to 2 pages in length and less specific structure for note making. 2. Map sketching with an emphasis on careful shading and labelling.
ROUTE THREE (Advanced students)	1. Everything on Route One and Route Two, plus: 2. An appreciation of why the extended family remains so important in North Ghana added to Section 2d of Route One. 3. An appreciation of why subsistence/semi-subsistence agriculture survives, including: (a) natural hazards (unreliable climate, river blindness), (b) attitudes towards risk - sub-optimal behaviour, (c) the land tenure system, (d) poorly developed transport and energy infrastructure, (e) regional disparities.	1. Everything on Route Two with reading extended to 7 pages in length with note making guide limited to a set of sub-headings. 2. More difficult map interpretation questions. 3. Several maps to be drawn and comparison made between them. 4. Essay writing using a set of paragraph headings.

FIGURE 1: SUMMARY OF CONCEPTUAL CONTENT AND LEARNING EXPERIENCES IN THE PEASANT AGRICULTURE SECTION OF THE WORKBOOK ON "MODERN GHANA" (Lidstone, 1983).

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4. GEOGRAPHY TEACHERS NEED TO BECOME AWARE OF AND BE ABLE TO IMPLEMENT A RANGE OF STRATEGIES SUITABLE FOR LEARNING BY LESS ABLE PUPILS

Less able pupils are separated into discrete classes in some schools. When this occurs, geography teachers have the opportunity to design and implement learning activities specifically for these pupils. Geography teachers in this study reported the use of direct observational experiences and audio-visual techniques as important strategies for teaching less able pupils. However, these teachers did not elaborate a breadth of teaching streategies for meeting the needs of less able pupils. Pick and Renwick (1983) offer advice and examples to develop effective teaching strategies for teaching less able geography pupils. They suggest that cartoons, games, simulations, problem-solving activities, inquiries and field work in the local environment and even pop music may be used to teach geography using the following teaching guidelines:

(a) Identify teaching targets clearly.
(b) Avoid pupil failure and build up pupil self-esteem.
(c) Reduce student dependence on others.
(d) Carefully grade learning material.
(e) Accept a slow speed of instruction.
(f) Maximise variety of resources and strategies.
(g) Consider motivational levels appropriate for the age group concerned.
(h) Provide swift and constant feedback.
(i) Evaluate pupil progress constructively.
(j) Reinforce learning and provide for adequate repetition and practise of skills.
(k) Be relevant.
(l) Be discriminating in the selection and production of resources.
(m) Constantly evaluate one's own performance.

This means that *geography teachers should design specific learning experiences for less able students and should not use the activities designed for more advanced geography pupils.*

5. GEOGRAPHY TEACHERS NEED TO BECOME ASTUTE SELECTORS AND DEVELOPERS OF APPROPRIATE RESOURCES FOR TEACHING GEOGRAPHY TO LESS ABLE PUPILS

A majority of the geography teachers surveyed indicated that they did not use resources designed specifically for less able pupils. They tended to use the same resources they used for the rest of their classes. Nevertheless, there is a need to downplay the written word in resources used in geography lessons for less able pupils. Hence, the use of cartoons, clear, simple maps and carefully structured graphics have been found to motivate less able pupils to learn and to offer them the opportunity for making sense of the material they are learning. Popular music has been found to be a very useful means of communication with less able pupils. This music is often used as a stimulus to learning involving cultural aspects and economic problems (see Renwick, 1981). Clearly, this implication intimates the necessity for geography teachers to plan, to implement and to evaluate a range of materials suitable for less able pupils. Experience is needed in transforming information into forms suitable for these learners. This may involve simplifying the information or it may mean reconstructing the information in a more appropriate form, e.g. a graphic time-line instead of a written account. There is little evidence to date that Australian geography teachers or textbook writers have come to grips with the challenge of appropriate resources for less able pupils.

6. GEOGRAPHY TEACHERS NEED PRACTICE IN THE CONSTRUCTION OF APPROPRIATE FORMS OF ASSESSMENT WHICH REFLECT THE CAPABILITIES OF LESS ABLE PUPILS

Most of the geography teachers surveyed paid scant respect to the idea of using assessment instruments which befitted the less able pupils. In fact, half of these teachers used the same test for less able pupils as for other geography pupils. The assessment instruments used with less able pupils should reflect the type of learning that has occurred and the nature of the pupils themselves. Less able pupils have had to live with failure for most of their school years because they have had to sit for the same tests as their more able peers. One solution for assessing less able pupils is to provide assessment activities built around the audio-visual materials used in normal lessons and to ask the pupils a number of open-ended questions in which there are no clear cut right or wrong answers. Issue-based tasks in which the pupils express their own opinions should be encouraged. This survey showed that most geography teachers had responsibility for teaching less able pupils. This suggests that these teachers should have responsibility for assessing their pupils as well. If this is so, then these geography teachers should be competent at constructing assessment activities suitable to the less able pupils. At present, few opportunities are available for geography teachers to design such assessment activities and to share these with other geography teachers.

7. GEOGRAPHY TEACHERS NEED TO UNDERTAKE PROFESSIONAL DEVELOPMENT ACTIVITIES TO BROADEN THEIR UNDERSTANDING OF THE LESS ABLE PUPILS AND TO DEVELOP SUITABLE LEARNING EXPERIENCES IN GEOGRAPHY FOR THESE PUPILS

The above implications for the geographical education of less able pupils hints strongly of the need to offer teachers the opportunity to engage in a variety of professional development experiences which focus on their development of a better understanding of the abilities of less able pupils and on the development of teaching/learning experiences to meet the needs of these pupils. Teachers need to be informed about less able pupils' abilities to reason, to perform skills and to express themselves. As well, teachers need to be informed about the needs and interests of these pupils so that the teachers can devise relevant, motivating learning activities. Experience and practice in devising teaching strategies for less able pupils is vital if geography teachers are to succeed with these pupils. Professional experiences developed and implemented by groups of geography teachers will be invaluable in meeting the challenge presented by less able pupils.

CONCLUSION

This study offers the opportunity for making genuine international generalisations about the teaching of geography to less able pupils. For its part, this Australian study indicates that geography teachers are aware of many of the attributes of less able pupils in geography, but that we have not done a great deal to meet the special challenges of these pupils. This has occurred because most teachers operate in mixed ability classes and because these teachers have had inadequate training in handling and teaching less able pupils. The range of curriculum implications highlight the pressing need to make geography teachers more aware of the less able pupil and to give geography teachers opportunities to become competent in teaching these pupils and so to make geography a desired part of their formal education. Obviously, this study is only a beginning in the analysis of different types of learners in geography and in the development of methods for these different learners.

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GEOGRAPHY METHOD COURSES AND STUDENT MORALE

Sr. Anne Carter

Abstract

Interest in several aspects of the education of prospective geography teachers led me to make a study of geography method courses in a selected number of British University Departments of Education. One of these aspects was the morale of student-teachers. The method I chose for gathering data was to visit each Department of Education and talk with the lecturer in Geography Method, the students taking the course and a selected number of past-students of the course. I also sat in on typical Geography Method sessions.

In British Universities the geographical education component of Post Graduate Certificate in Education courses comprises three sections: Theoretical, Practical and Teaching Practice. According to the degree of emphasis placed on one or other section, and the orientation of the course aims, I classified each Geography Method course into one of three categories: Pupil-learning Oriented, Educationally Oriented, Teacher Oriented.

Student morale level is seen to be related to course aims. Where these aims are Pupil-learning oriented and teaching strategies allow active student participation, morale is found to be high, but medium to low where aims are 'Educationally' oriented; medium to high where they are Teacher oriented.

As I visited each University Department of Education (herein after referred to as U.D.E.), I became increasingly aware of differences in the morale of student-teachers. Consideration of the importance that high morale plays in a classroom led me to examine several aspects of the Geography Method courses, in order to see if there is any relationship between them and the morale of student-teachers. Although there are other significant variables, I have selected the three aspects which seem to be most influential to morale level, namely: (i) Aims of the Course; (ii) Teaching Strategies used; (iii) Content: as

TABLE 1

INDICATORS OF STUDENT MORALE

INDICATOR	DESCRIPTION
ATTITUDE	Relaxed or tense with peers and Tutor during lecture/seminar/tutorial or workshop sessions. Course seen as necessary evil or fulfilling relevant aims.
VERBAL	Students express frustration or satisfaction with course, as to relevance to classroom, teaching, relationship with pupils, appropriate to geography teaching, practice in planning and presenting lessons, etc.
CONVERSATION	Positive or negative comments; universal agreement or disagreement about relevance or non-relevance of course to teaching practice. Students chat easily and positively about the course, or have little to say except concisely-worded, negative comments. Conversation ease or difficulty.
FACIAL EXPRESSION	Tense, anxious, bored; or smiling, intent, interested. Maintaining the respective expressions throughout entire interview or Method Session.
GROUP INTEREST	Students as a co-ordinated group showed involvement and interest in planning interesting/novel lessons and devising methods of presentation. Group showed initiative; OR Group lacked interest and enthusiasm, waited for direction, showed doubt as to how to proceed with lesson structure, etc. Unable to communicate easily with Tutor.

TABLE 2

RELATIONSHIP OF STUDENT MORALE TO AIMS OF SELECTED GEOGRAPHY METHOD COURSES

UDE	CAT	MORALE LEVEL	ORIENTATION AS SEEN BY		CORREL-ATION	DIFFERENCES BETWEEN TUTOR'S STATED AIMS AND STUDENTS' PERCEPTION OF THESE
			TUTORS	STUDENT		
4	2	H	T & P	T & P	+	Nil.
1	3	H	T	T	+	Students omit 'dedication' of teacher.
7	2	H	P (&T)	T & P	+	Students emphasise both Pupils and Teacher.
14	2	H	P & T	P & T	+	Nil.
11	3	H	T	T	+	Nil.
6	2	M-H	T & G	T	+ to o	Students omit 'geography'.
10	3	M-H	G & T	T	+ to o	Students emphasise Teacher.
21	2	M-H	P.T&E	T & E	o	Students ignore 'education'.
16	1	L	T & E	T,E,P	o to -	Students tend to look towards Pupils.
12	1	M-L	E	T & E	+ to o	Students see 'education' as aim.
19	3	M-L	T,G,E	E & T	+ to o	Students see 'education' as aim.
18	1	L	G & T	G (&T)	+ to o	Students see 'geography' as aim.

KEY: MORALE LEVEL - H = High
M = Medium
L = Low

ORIENTATION - T = Teachers
P = Pupils
G = Geography
E = Education

CORRELATION - + = Strong
o = Medium
- = Little

to emphasis on theoretical and practical components of the Geography Method courses. I have selected twelve U.D.E.s to illustrate my hypothesis.

Table 1 shows "Indicators of Morale", from which I devised the three levels as to High, Medium and Low. If the Attitude of the group of students was very positive, and students were actively involved in the Geography Method sessions, participating fully, e.g. in planning some work or constructing a model, or contributing freely to discussion, I classified their morale as High. Similarly, if students early in the interview expressed verbally their satisfaction with the relevance of the course to their experience of teaching, I classified their morale as High. This opinion was reinforced if students, as a group, maintained this satisfaction throughout their conversation with me, and more importantly, through interchange of opinion amongst themselves. I observed, too, the facial expression of students which was evident by a relaxed and smiling expression. If the group appeared to be working as a unit and with a positive attitude, secure, for example, with techniques of lesson planning, appropriate use of resources, and showing an easy working relationship with each other and with their Tutor, I classed their morale as High. The opposite to these types of behaviour were identified as indicating Low morale, whereas Medium lay somewhere in between.

Table 2 shows the relationship between Student morale and stated Aims of Geography Method courses. Included in this Table are orientations of these aims to one or other of three Categories into which each Geography Method Course can be placed: Pupil-Learning Oriented; Teacher Oriented; Educationally and Geographically Oriented. It also shows the degree to which correlation exists between the course aims as stated by Tutors and the way the Students see the orientation of these aims. This correlation is important for it shows the desire that Students have to participate in a course which will educate, guide and direct them as to the learning needs of pupils and the ways by which they can help children to learn. Students appear to look for a worthwhile goal and commitment and see this as directed towards pupils' needs. Where Students see the aims of the course as focussing on these learning needs and towards the education of

TABLE 3

AIMS OF GEOGRAPHY METHOD COURSES

ACCORDING TO ORIENTATION

Aim No.	Aim	U.D.E.
(a)	TEACHER ORIENTED:	
1.	To achieve competence in classroom management and organisation.	1, 14
2.	To be enthusiastic about geography teaching.	1
3.	To encourage development of own potential for teaching.	
4.	To prepare students to cope with initial problems of Teaching Practice and initial year of teaching - "survival" in the classroom.	10, 11
5.	To encourage the student in the development of an attitude to teaching as a personal activity which offers continual challenge.	21
6.	To encourage confidence and enjoyment as a teacher.	7
7.	To give students professional expertise as teachers.	4
(b)	EDUCATIONALLY ORIENTED:	
8.	To develop the professional knowledge, understanding, skills, attitudes and values appropriate to a probationary teacher.	12
9.	To encourage critical analysis and evaluation of selected materials, reports and research studies.	12
10.	To grow in knowledge and awareness of curriculum process and development.	21
(c)	GEOGRAPHY ORIENTED:	
11.	To see geographical education as relevant to modern times.	18
12.	To sustain continued interest and enjoyment in the study and teaching of geography.	19
13.	To produce teachers committed to their subject.	6
14.	To help geography appear interesting and realistic.	10
15.	To equip students with geographical skills for teaching geography.	16
(d)	PUPIL ORIENTED:	
16.	To encourage pleasure at working with children.	4
17.	To achieve honesty and integrity in selection of geographical content.	14
18.	To have an awareness of the effective use of pupils' time.	14
19.	To develop empathy for pupils as learners.	14
20.	To safeguard the interests of children to ensure that they will develop positive attitudes, and to this end be concerned about the type of geography to teach.	7

student-teachers to serve those needs, their morale is high. They then feel challenged by a worthwhile goal. However, where the course aims are directed towards theoretical elements and appearing to promote geography per se as unrelated to children's learning, students say the course in Geography Method is irrelevant to the classroom at the present stage of their teacher-education and training. Table 2 shows that there is a relationship between (a) morale, (b) orientation of course aims, and (c) the way in which students perceive the direction of the course.

Tables 3 (a), (b), (c) and (d) show samples of aims of Geography Method courses and their particular orientations. Numbers on the right refer to the U.D.E. selected for the comparison. Table 2 should be read in conjunction with Table 3, for it shows that U.D.E.s whose aims are Teacher and/or Pupil oriented, have the highest student moral level - these being U.D.E.s 1, 4, 7, 11 and 14. U.D.E.s 6 and 10 show a tendency towards promotion of geography (See Table 3 (c) Aims 13 and 14). It is interesting to note that in these instances, Student morale is slightly lower than in the case of the previous five. In U.D.E. 10, Students emphasise 'Teacher' aims more than 'geography' aims, which indicates that the personal emphasis by the Tutor is probably not revealed in the written aims. In discussion with this Tutor and the Students, I found a stronger emphasis on Pupil's Learning and on personal assistance to the Student, than the written aims suggest. Table 2 shows that U.D.E.s 12, 19 and 18 have a Medium to Low morale level. Here the Tutors expressed aims are more 'educationally' oriented than are those in U.D.E.s at the top of Table 2. This is borne out also, by information gained through interviews with Tutors and Students. The latter see the courses as having a strong theoretical emphasis and cannot see the relevance of the theoretical elements of Geographical Education to practical classroom teaching. (By 'Geographical Education' in this context is meant the elements of Section I as shown in the Appendix.)

Associated with the aims of the course and with morale level of Students are the Teaching Strategies employed. U.D.E. 4 uses 65% of teaching time in Discussion, Workshops, Demonstration of A/V, use of Games and Simulations; 20% is allocated to school-based work and the remainder to fieldwork and to talks by occasional visitors (teachers). Theory is made relevant here because Students are led by the Tutor to consider the *underlying rationale, i.e. philosophy and psychology, etc., of the task undertaken in each workshop session. There is relevant integration at U.D.E. 4 between theory and practice, which Students recognise. Student morale is High at this U.D.E. - all were busily and enthusiastically participating in the activities and accompanying discussion of the Workshop session. Interest in the task in hand was obvious as was the concern for pupils' learning, which became evident in the interview with Students. All Students here worked co-operatively as a unified group, which involved the Tutor. In discussion with me they all expressed sincere appreciation of the course and the Tutor's role. These Students commented that the course in Geography Method is "excellent" and has "a very good" practical bias; "it challenges us to re-evaluate our values and to be open-minded." Similar distribution of time amongst similar Teaching Strategies is characteristic of U.D.E.s 1, 7, 6, 11 and 14. As Table 2 shows, U.D.E. 6 has a lower level of morale among students than have the previous five. In this case Students appeared quite satisfied with the course structure, orientation of aims and relationship between theory and practice, but are somewhat frustrated by the small segment of time (two hours per week) allocated to Geography Method. Consequently, they are unanimous in stating that there is insufficient time for preparation of materials, lessons etc., for actual classroom use. They see the aims of the Geography Method course as being over-concerned with theoretical elements when the limited time could be more profitably spent in concentrating on the learning needs of children and ways to encourage learning, and on specific practical aspects, e.g. teaching mixed ability classes. Students in U.D.E. 10 find the Geography Method course deficient in some aspects of practical work, for example, how to evaluate children's work, planning lessons for mixed ability. Similarly, Students at U.D.E. 12 said that some of the time spent by the Tutor in lecturing on various theoretical aspects would have been better spent on practical sessions and on discussion of issues pertaining to the classroom. At U.D.E. 16, the Geography Method course is undergoing considerable change. Students here find the course strongly theoretical at present and see the need for more practical session and more discussion. Students at U.D.E.s 18 and 19 also comment on the inadequate amount of time allocated to Teaching Strategies which involve them actively. At these U.D.E.s, Student morale level was Low and Medium to Low, respectively. Thus, where the greater emphasis is laid on lecturing or Tutor-led discussion, rather than on active participation by students, as occurs for example, at U.D.E. 4,*

TABLE 4

TEACHING STRATEGIES: (OF SELECTED U.D.E.s) PERCENTAGE OF TEACHING TIME

STRATEGIES	U.D.E.											
	1	4	6	7	10	11	12	14	16	18	19	21
Lecture	0%	5%	10%	0%	Varies from year to year. Workshops and variety always emphasised	20%	Varies from year to year.	0%	Tutor did not complete the questionnaire.	50%	5%	5%
Group Discussion	20%	25%	20%	25%		25%		60%		10%	60%	50%
Micro-teaching	10%	5%	10%	0%		0%		10%		10%	0%	10%
Micro-teaching T/V	0%	10%	0%	0%		0%		0%		0%	0%	10%
Student-led Seminars	20%	10%	10%	2%		15%		0%		0%	5%	10%
Fieldwork	10%	5%	10%	8%		15%		20%		10%	*	10%
Workshops	10%	10%	30%	40%		10%		?		20%	5%	10%
School-based work	30%	20%	10%	15%		15%		10%		0%	10%	0%
Demonstration, e.g. A/V	+	5%	0%	5%		5%		0%		0%	5%	5%
Other	0%	5%	0%	0%		0%		0%		10%	0%	0%

+ included in workshops

* dealt with outside the U.D.E.

Emphasis at U.D.E. 10 varies from year to year.) Tutors'
Emphasis at U.D.E. 12 varies from year to year.) statement
Tutor at U.D.E. 16 did not complete the questionnaire.

the lower appears to be the morale of students.

The Tutor at U.D.E. 18 is strongly committed to teaching geographical content, thus attempting to fill gaps in students' knowledge and training Students to teach specific geographical content. The method for doing this is the use of lectures illustrated by black-board diagrams, OHP transparencies, slides or filmstrips, about specific content; and as to the method the Tutor feels is the best way to teach geography. The Students see the course as an inadequate preparation for teaching practice, because it does not offer any practical instruction or advice as to lesson preparation, the level at which to pitch the subject matter, construction of materials, or how to manage a class. Seminars and Workshops occupy approximately 20% of the course time, according to the Tutor's estimate, but Students see this as considerably less. The Tutor places emphasis on practical work and aims to produce "really PRACTICAL teachers". Students regard the "Workshop" sessions as mainly demonstration periods, by the Tutor, of resources, method, etc., but not sessions in which they are actively involved and participating. Students stated that they would prefer to participate in these practice sessions to a far greater extent, instead of observing demonstrations. I found Student morale at this U.D.E. was Low, because Students felt unprepared for teaching practice, were unable to participate actively in learning processes and felt that the aims of the course were not relevant to the classroom situation. Students looked, and stated they were, bored and frustrated by the large amount of geographical content as opposed to the lesser degree of methodology and lack of student participation in discussions and workshops. However, the aims of the course are well achieved, as indicated by recently-qualified Teachers, and according to them, morale rises as the year proceeds. Discussion with these Teachers revealed that they felt adequately equipped to teach specific content and, as they were (at the time of the interview) teaching in traditional schools, the lecture-notetaking and demonstration strategies were appropriate to their needs as teachers. They expressed satisfaction with the course, saying they felt secure with 'packages' of geographical knowledge and lesson methodologies which they had acquired from the course.

Although the percentage allocations of time, shown in Table 4 are approximate, they serve to highlight my hypothesis. Table 5 adds support by showing that Content as well as Aims and Teaching Strategies are closely

TABLE 5

COURSE CONTENT

% ALLOCATION	*U.D.E.*											
	1	*4*	*6*	*7*	*10*	*11*	*12*	*14*	*16*	*18*	*19*	*21*
Skills, concepts	*0%*	*25%*	*0%*	*20%*	*25%*	*15%*	*Question not answered*	*0%*	*Question not answered*	*20%*	*20%*	*0%*
principles, etc.	*0%*	*25%*	*0%*	*20%*	*25%*	*15%*		*0%*		*20%*	*20%*	*0%*
Gen. Methodology of Teaching	*30%*	*25%*	*50%*	*25%*	*25%*	*50%*		*45%*		*15%*	*30%*	*47%*
Teaching Techniques	*40%*	*40%*	*25%*	*45%*	*25%*	*20%*		*45%*		*50%*	*30%*	*48%*
Theory - aims objectives, etc.	*30%*	*35%*	*25%*	*10%*	*25%*	*15%*		*10%*		*15%*	*20%*	*5%*

(U.D.E.s 12 and 16 did not answer this question on the Questionnaire.)

The above Table shows great variation on Content emphasis, but the important aspect of it is that the U.D.E.s allocating between 20% to 40% of Content to General Methodology and Teaching Techniques are those which show the highest level of morale among students. This Table must be read in conjunction with Table 4 and in the context of the previous discussion.

There are many other factors contributing to Student morale level, details of which the scope of this work does not allow. Some of these factors are the type of preparation for teaching practice, the supportive role of the staff at the Teaching Practice schools; ease of relationship between Tutor and Students. As well as these factors, I am aware of many variables, such as time of year at which I visited the particular U.D.E.; degree of success at Teaching Practice at which many Students were then involved, or had recently completed at the time of my visit; and individual personalities. I lay the greatest emphasis, however, on the three factors discussed in this chapter, namely, Course Aims, Teaching Strategies and emphasis within the Content as to theoretical and practical elements and degree of interrelationship that is evident. There appears to be strong support for the hypothesis that Student morale level is closely related to Course Aims, Teaching strategies and Content of the Geography Method course.

associated with Student morale levels. Where general methodology and teaching techniques, applicable to geography, are dealt with by actively involving Students, morale is High. Where theoretical elements of the course are emphasised to an apparently greater extent than are the practical elements and are seen to be unrelated, morale tends to be lower. Where course aims are Pupil Learning and Teacher Oriented, morale is High or Medium to High.

APPENDIX

GEOGRAPHICAL EDUCATION COMPONENT OF TEACHER EDUCATION COURSES

COURSE STRUCTURE

SECTION I: THEORETICAL

Elements:

Historical development of geography in schools.
Impact of Change on school geography.
Nature and Approaches to school geography.
Aims and Objectives in school geography.
Trends in geography, and school geography.
Teaching for Values and Attitudes.
Analysis of Schools Council Projects and other geography projects.
Principles, etc., of curriculum development and design.
Language in geography.
Learning in geography: concept formation; perception; mental maps; environmental awareness.
Learning theories applied to geography, e.g. spiral curriculum.
Structuring a syllabus or teaching unit.
Environmental Education.
Geography and/in the Integrated Curriculum.
Geography and the Structure of Knowledge.
Examination Boards' syllabuses - content, aims, etc.
The Examination system and teachers' role in it.
Teaching Physical Geography.
Teaching Human Geography.
Place of Field Studies in school geography.

SECTION II: PRACTICAL

Elements:

(i) *Teaching Strategies Advocated:*

Use of A/V aids (films, slides, overhead projector, television, etc.).
Games, Simulation and Role Play.
Use of Schools Council Projects, or other Projects in geography.
Use of worksheets.
Use of black-board and 'chalk and talk'.
Data/Response.
Use of photographs.
Group activity (other than games).
Map Interpretation.
Models.
Quantitative methods.
Dictation/Copying/Note-taking.
Fieldwork incorporation into lessons.
Use of text book.
Discovery Learning, e.g. research topic.
Maps and Charts.
Hand-outs ("Banda" sheets).

SECTION II: PRACTICAL

Elements:

(i) Teaching Strategies Advocated: (Cont.)

Use of Atlas.
Use of Computers.
Discussions.
Construction of resources - charts, models, diagrams.

(ii) Teaching Skills:

Blackboard writing and appropriate use of black-board.
Questioning techniques.
Planning and Structuring Lessons.
Constructing Test Items.
Marking Pupils' work - assessment techniques.
Team Teaching.
Handling and operating equipment, e.g. projectors.
Teaching mixed ability classes.
Teaching low ability classes.
Teaching Sixth Form.

(iii) Classroom Management Techniques:

Control, e.g. pupil movement, book distribution, etc.
Discipline techniques.
Organisation of activities.
Voice - level and variation.
Teacher-pupil relationship.

(iv) Fieldwork:

Structuring and teaching a unit of field work.
Methods of teaching in the field, e.g. testing hypotheses, observation and recording, use of maps, quantitative techniques.
Evaluation of methods of field work.
Observation of fieldwork teaching.
Opportunity to teach children in the field.
Orienteering.
Safety regulations.
Organisation and administration as regards fieldwork teaching.

SECTION III: TEACHING PRACTICE:

Elements:

Preparation (mainly concerned with Section II).
Visiting Students by Tutor.
Liaising with schools and responsibility for selection.
School Tutor/Supervisor Scheme.
Duration and spacing of Teaching Practice periods.
School-staff-student relationship.
Feedback of information and provision of assistance to students.
Guidance and assessment procedure.

GEOGRAPHY IN THE NEW ZEALAND EDUCATIONAL SYSTEM AND THE PROCESS OF CURRICULUM CHANGE - SOME TRENDS AND CURRENT PROBLEMS

Frances Slater*

Abstract

Geographical education throughout the world has changed substantially in the last twenty years. The Forms 5 to 7 geography curriculum in New Zealand has recently been redesigned. This paper outlines how changes to this curriculum have occurred and it offers a critique on their effectiveness. Key conclusions from the critique are that the nature of the subject of geography has dominated the changes in the curriculum at the expense of the needs of students and the wider society; that not enough support is given to teachers to implement the curriculum and that more support ought to be given to a social orientation of the Forms 5 to 7 geography curriculum.

CONTINUALLY CHANGING GEOGRAPHY

The aims and objectives, content, teaching strategies and methods of evaluation associated with geography in the New Zealand educational system have been (1) subject to changes over time and have (2) incorporated trends familiar to geographic educators. In this essay I shall give a general account of major changes and significant trends in recent decades, all of which indicate shifts in aims and objectives of certain kinds. In addition I shall point up certain weaknesses in the working assumptions of curriculum changes and the process of change as managed in New Zealand geography circles.

I can illustrate some of the changes quite simply, if anecdotally. My parents as second generation New Zealanders can recount with some pride being able to recite the rivers and mountains, towns, ports and products of any number of countries. One might say that the globe was well known to them. My sisters and I were proficient at (1) drawing sketch maps and pencilling in regional boundaries with care and interest, (2) interpreting regional characteristics and personality from topographical maps and (3) memorizing notes on the regions of New Zealand, Australia, North America, Asia, Britain and Europe.... Places and areas not yet visited were familiar and real to us. People at school now, in New Zealand, are being initiated into scientific geography, systems, environmental interrelationships, some quantitative analysis and field work techniques. They may come to say, "We learned a great deal about inter-connections among phenomena". Rather they will probably say for example that we studied landslides, hurricanes in the South Pacific, and problems of tropical agriculture and food production. Then the next generation of whom my nieces are part may take little interest in history or geography. (I find Claval's (1978) polarisation of classical man and psycho-analytic man persuasive and of significance especially in an educational system which has already taken geography out of the compulsory core and left it as one of many electives in the upper school). _If_ my nieces do choose geography as a fifth or sixth and seventh form study, then I hope the present curriculum will be sufficiently reoriented so that they will remember that geography taught them about managing the environment and evironmental decision making. I am confident that despite the shrinkage of the last forty years, geography will remain as an available choice until the end of the century. Its popularity and perceived relevance cannot be so much taken for granted however.

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Clearly, as in other educational systems, the knowledge considered to be of most worth within geography has changed over decades. It is equally important to note in the New Zealand curriculum context, with its emphasis on social studies that these changes most predominantly if not most wisely, reflect the development of geography as an academic discipline. Perhaps geographic educators should have been more conscious of geography's possible social goals, since the second important change, geography's diminishing place in the curriculum is largely the result of strong support over a long number of years for a society-centred curriculum. In fact the tensions giving rise to choices between knowledge based and society based curricula are nicely illustrated in the history of the New Zealand history/geography/social studies developments. To be detected therein is the mixing of curriculum messages from Britain and the United States though one must not underestimate a dominant indigenous desire that education should be a social education for life. Perhaps this is not surprising in a country early strongly committed to social welfare policies and psychologically bound to the notion of egalitarianism expressed in its linguistic register as "Jack's as good as his master."

A CHANGING PLACE

Geography's place in the general curriculum has altered markedly over the years. Today, geography is usually taught only in high schools and then only to those students in the third, fourth and final fifth year of high school. Facts and issues generally agreed to be of concern to geographers are very sparsely used and studied at primary (students aged 11 and 12) and lower senior (students aged 13 and 14), levels. At these levels some history, geography, civics and politics, sociology and anthropology is formalised within a curriculum designation, social studies.

THE RISE OF SOCIAL STUDIES

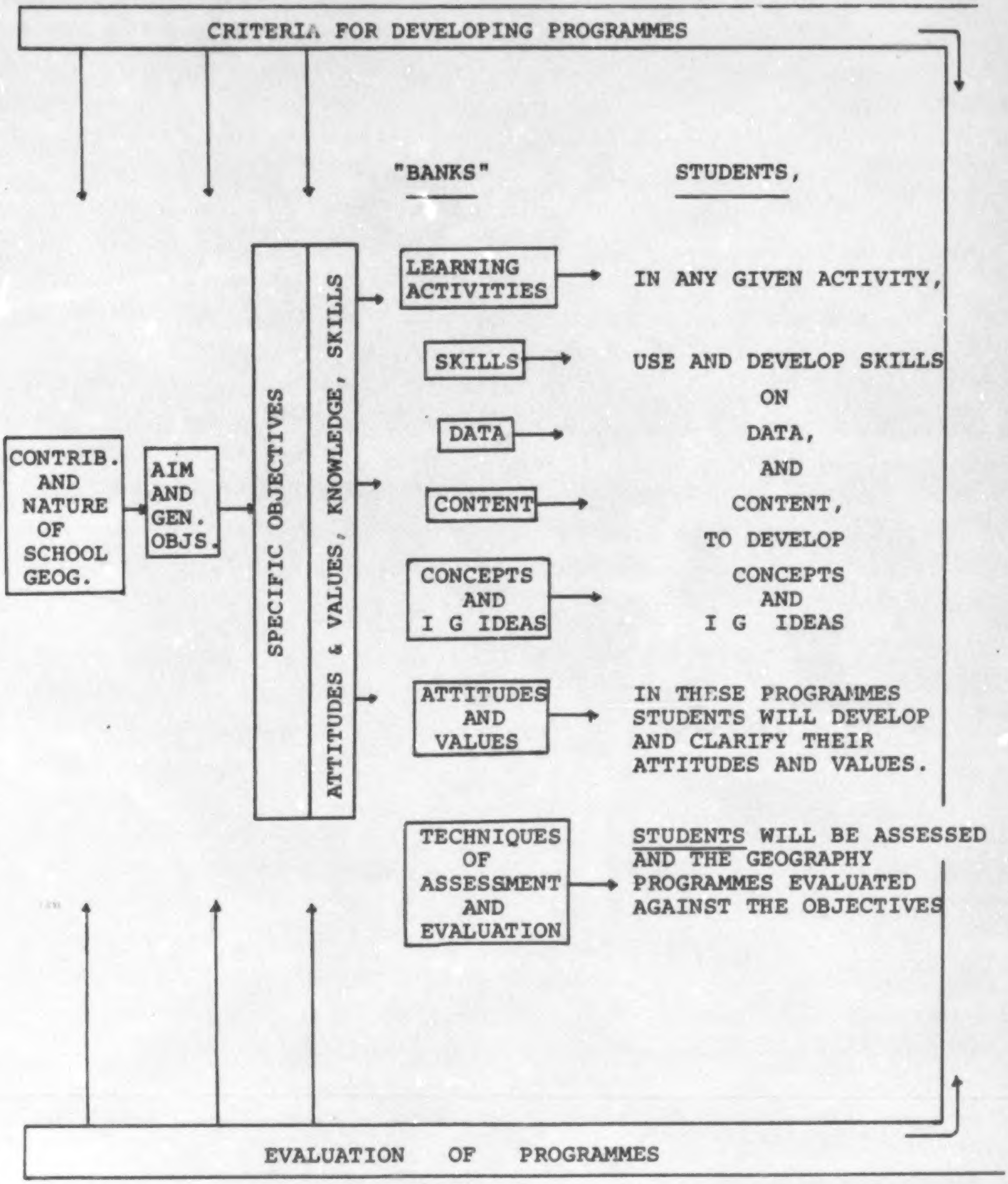
Social Studies is a post World War II development reflecting a concern to provide children with a society based, people oriented and socially relevant education. At first and up to the mid-sixties it was no more than a combination of history, civics and geography. In the last twenty years curriculum planning schemes emanating from the Department of Education and strongly supported by teacher trainers employed in Government funded teacher training colleges have articulated major themes or concepts for study at intermediate and lower secondary levels. These themes are closely linked to sociological and anthropological ideas and include cultural difference, interaction and social control.

The settings or context in which exemplars of these themes are studied vary so that for example, such contrasting cultures as the Cook Islands, Indonesia, Japan, Victorian England or the USSR may be studied to exemplify the main ideas. Any geography and history is however, absolutely subordinate to understanding social control mechanisms in the society of Victorian England, for example. Understanding society is the major objective and students will be only incidentally aware of any associated history or geography and for the most part it will be a very low level history or geography. Geography, along with history has been quite firmly assigned to the upper school curriculum where it must now compete with an ever expanding range of subjects on offer.

A CHANGING CONTENT

During the 1960s and largely in response to reactions against over-loaded regional geography syllabi, separate and largely uncoordinated prescription changes occurred at School Certificate (Third year, 15 year old students), University entrance (fourth year, 16 year old students) and University

Figure 1. FORMS 5 - 7 GEOGRAPHY: NATIONAL GUIDELINES


CRITERIA FOR DEVELOPING PROGRAMMES
"BANKS"
STUDENTS,
CONTRIB. AND NATURE OF SCHOOL GEOG.
AIM AND GEN. OBJS.
SPECIFIC OBJECTIVES
ATTITUDES & VALUES, KNOWLEDGE, SKILLS
LEARNING ACTIVITIES
IN ANY GIVEN ACTIVITY,
SKILLS
USE AND DEVELOP SKILLS
ON
DATA
DATA,
AND
CONTENT
CONTENT,
TO DEVELOP
CONCEPTS AND I G IDEAS
CONCEPTS AND I G IDEAS
ATTITUDES AND VALUES
IN THESE PROGRAMMES STUDENTS WILL DEVELOP AND CLARIFY THEIR ATTITUDES AND VALUES.
TECHNIQUES OF ASSESSMENT AND EVALUATION
STUDENTS WILL BE ASSESSED AND THE GEOGRAPHY PROGRAMMES EVALUATED AGAINST THE OBJECTIVES
EVALUATION OF PROGRAMMES

Bursary and Scholarship (fifth year, 17 year old students) levels. At the School Certificate level the Department of Education is the controlling authority and at the other levels, the universities hold a tight control. The syllabus statements of that decade certainly loosened the grip of regional geography and made it possible for a few innovative teachers to incorporate and/or adapt ideas and exercises from the American High School Geography Project, particularly those illustrating location problems and decision. Simulation games and to a lesser extent role plays entered the geography classroom. Pioneering the Pumice for example, is the New Zealand adaptation of the HSGP game of farming (Renner and Slater, 1974). The systems framework filtered into school geography and soon farms and industries were illustrated as input - output systems in students' notebooks as one replacement of regional sketches. The scientific method as a teaching method was mandatory at the seventh form and hypothesis testing began with enthusiasm. A textbook for School Certificate candidates (15 year olds), New Zealand Geography, a systems approach (Knight, Buckland and McPherson, 1973) and a fieldwork guide for seventh formers (Slater and Hearn, 1972) illustrate the impact of scientific geography with its swing from regions to systematics, models and statistics.

This move from regional to systematic studies in the separate syllabi was unaccompanied by statements of the objectives of prescriptions and the intent was buried in preambles or sets of notes placed in appendices. The rapid development of curriculum theory and practice in academic circles was not matched to the new geography. Psychology and learning theory were still thought to be the teacher's best prop from the educational wardrobe. But as examiners and moderators were replaced on certain boards, new objectives for geography were established, a wider range of teaching methods encouraged and examinations were to some extent revamped. All this change was sufficiently piecemeal or so clearly laid down from on high that teachers could fairly easily make the necessary adjustments and buy the necessary new textbooks and pamphlets. However, the syllabus changes of the 1960s had not produced a co-ordinated curriculum for the three years of the senior school, and curriculum theory was now to make its impact as it concepts and principles spread. The Post Primary Teachers Association Geography Panel organised regional and national consultation. The New Zealand Geographical Society formed a Board of Geography Teachers (BOGT) which acted as another pressure group. It carried out curriculum research which indicated a need to have much more information as a basis for decision making about curriculum change. Teachers' refresher courses, national and local, in service courses and inspectors of schools, all recommended a more fundamental review and co-ordination of rorms 5 to 7 geography.

A CURRICULUM LANDMARK

In February, 1974 a national curriculum conference was convened by the Department of Education to consider school geography as an entity (Young, no date). The course report, "The Development of a Co-ordinated Curriculum Forms 5, 6, 7" recommended that there was a need to start afresh if co-ordinated programmes were to be developed. As a result, the National Geography Curriculum Committee was established in 1974. This was the first subject committee to range across the three examination levels and to consider developments of a non-examination nature in a subject. The membership of the National Geography Curriculum Committee (NGCC) consists of nominees from the School Certificate Examinations Board, the Universities Entrance Board, the Post Primary Teachers Association, the Combined Association of Independent Schools, Teachers Colleges and members of the Department of Education, especially inspectors and curriculum officers. The committee also includes two nominees from the New Zealand Geographical Society, one of whom represents the Board of Geography Teachers, the other representing geographers working outside the education system. Co-opted members usually include some practising teachers on an annual teaching fellowship.

At its inaugural meeting the committee recognised that it was not in the business of rewriting prescriptions as this task was the prerogative of the examination boards. It knows its place. Its powers are limited. Rather it accepted the task of identifying, which if any, fundamental changes were necessary in developing and co-ordinating the teaching of geography. In particular the NGCC saw the need to develop a total curriculum statement for geography, a plan for learning, within which there would be flexibility for schools to develop according to the needs of their particular clients, the expertise of its teachers, the resources that were available and the organisational climate of the school. In order to give coherence and structure to the process of formulating this plan, a curriculum process model was adopted.

Figure 1 illustrates a general model elaborating criteria for planning developments to guide much of the work of the committee and the associated networks of teachers which were established for debate, development and dissemination. The concept of banks is specified within a Helburn type model. Groups of teachers worked to specify the items within the skills bank, content bank and so on. In that respect the concept apparently has been of value in curriculum development and, theoretically, reference to the banks helps to build up not only the content/concept dimension of learning but the presentation dimension. The banks were intended to be the mechanism permitting selections to be made in building up local programmes of learning (within nationally agreed outlines). But has it worked out like this? Has one broad national curriculum document been able to act effectively at national and local levels in the planning process? I shall explore these questions later.

NATIONAL GUIDELINES

Let us look first at the general orientation of the national guidelines. These were defined for forms 5-7 geography in Newsletter number 8 1976. The aims and objectives stated in that bulletin are set out in Figure 2. These remain unchanged to the present day.

Figure 2. AIM AND GENERAL OBJECTIVES OF SCHOOL GEOGRAPHY

General Statements of Aim

- To develop an understanding of the total environment as the home of man.

General Objectives for All Students

- To develop and apply the skills and techniques used in geographic inquiry and interpretation.
- To develop an understanding of the features of the physical environment and of the cultural environment, emphasizing the interrelationships and issues associated with them.
- To enable students to contribute to society through being able to make soundly based decisions about man-land relationships and issues associated with them.
- To foster a continuing interest in, and encourage an appreciation of, the qualities and needs of the environment.
- To develop an empathy with people in our own and other societies.

The aims and objectives seem sound enough, realistic apart from the last, and fundamentally well within the mainstream of what geographers ordinarily claim to be their contribution to education. There is some incorporation of a societal perspective in such statements as "..... a desire for continuing involvement in the balanced use of the environment" and "the ability to contribute to the planned use of the environment".

Such aims can be fulfilled only by the study of conflict issues in society. I interpret the balance of the changes however, not to have swung as decisively as I would like to an education in the politics of the environment and socio-spatial problems which would reinforce the societal aims of the New Zealand educational system. I would like to emphasize here a point hinted at earlier. I feel that architects of geography syllabi in the past and now in the present have severely neglected the strong society oriented bias in the New Zealand curriculum. The New Zealand educational system has shown a preference for trying to develop understanding of people and society. Of the three touchstones in the selection of content at a national level - the nature of the subject, the needs of students and the needs of the wider society, it seems that the nature of the subject has dominated at the national and assessment level. Good teachers in classrooms will have oriented work towards students and society. The co-ordinated curriculum of Figure 3 is beginning to put societal issues to the fore at form seven level though why suggestions are not set more firmly in New Zealand society I do not know. Perhaps we don't want to touch controversial issues in our own society. There is an opportunity to extend societal issues more firmly into forms 5 and 6 - indeed this can be accomplished very simply by viewing topics as societal issues. If this opportunity is neglected it may come to be one of the reasons for the final demise of geography in the New Zealand curriculum. New Zealand geography curriculum builders, it seems to me, have always been too ready to listen to messages containing a subject view of the place of geography in an education.

A CURRICULUM BLACKSPOT - THE MISHMASH CURRICULUM (O'Malley, 1981)

The path of curriculum change is not a smooth one. It is a very complex undertaking and difficulties are now appearing in the process. O'Malley reports in no uncertain terms his reaction to the long awaited co-ordinated curriculum proposal and he describes the reactions of other teachers too. Both his reaction and theirs are negative. Yet O'Malley feels, that despite objections, the proposed syllabus will be implemented.

Figure 3 outlines part of the co-ordinated curriculum diagrammed in O'Malley's article. The particular objections, as reported by O'Malley, are to any further changes in the Form 5 prescription and to the additional internal assessment. O'Malley in his analysis goes further and in my opinion

Figure 3. COMPULSORY CORE TOPICS - FORMS 5 - 7

STRAND	FORM 5	FORM 6	FORM 7
	6 mini units of 2 weeks each	6 mini units of 2 weeks each	At Form 7 there are three studies of a very open nature relating to planning and processes.
	POPULATION Population of New Zealand Population of Monsoon Asia	URBAN SETTLEMENTS one New Zealand city one overseas millionaire city	A study of a cultural process (e.g. urbanisation) illustrated by two examples, 1 New Zealand 1 overseas.
III	THE HAZARDOUS ENVIRONMENT a geomorphic hazard in New Zealand a climatic hazard in South West Pacific or Australia	NATURAL LANDSCAPES a New Zealand study a continental or global contrasting example	An environmental study in a New Zealand setting of a predominantly natural process
	RESOURCES farming in New Zealand mining in Australia	DEVELOPMENT INEQUALITIES study of two countries outside New Zealand illustrating contrasting levels of development.	A study of an overseas planning activity of regional, national or global nature with significance for geographic planning in New Zealand

accurately pinpoints some of the weaknesses in the proposal and in the process of curriculum change. "The present syllabus outline is a complex, incoherent and vague document that offers maximum flexibility but with insufficient teacher guidance". In particular he sees the syllabus as:

1. lacking structure
2. offering no guidance to teachers, giving no help in fitting the jig-saw together
3. lacking co-ordination, not offering it both within years and across years
4. lacking content and mistakenly replacing content with concepts and skills
5. having a mistaken faith in concepts
6. paying no regard to the availability of resources
7. providing too much time for practical work and field work
8. creating severe difficulties in relation to the reliability and validity of assessment.

O'Malley's critique is sound and I share all his misgivings. He then proposes his own syllabus which deals with some of the problems. I prefer briefly to ask why has this situation arisen? What is amiss with the curriculum change process as evidenced by O'Malley's objections. Any answers I find, any diagnoses I make, I should like to emphasize, derive from the sometimes disparagingly referred to theory of curriculum planning. If there wasn't theory to set against practice and malpractice I would be as dismayed as O'Malley and his teachers about the difficulty of finding solutions.

LEVELS OF CURRICULUM PLANNING

Biddle (1976) and later Graves (1979), have specified a hierarchy of curriculum planning and discuss models appropriate to the general level and the instructional level. It seems to me that the NGCC has concentrated on planning at the national or broadest level only and has largely neglected to provide the kind of support that smaller curriculum groups throughout the country would need to plan instruction at the local level. Some in-service courses have taken place, I know, but this is rather different from providing resources and unit construction guidelines for stable local groups.

I think it is probably true also that the NGCC failed to have a grasp of the hierarchy of levels inherent in curriculum planning and this perhaps explains the lack of thought given to ways of putting, as always, general aims in practice at the level of lesson and unit planning. Strategies for operationalising broad curriculum guidelines (apart perhaps from the concept of banks) seem to be lacking. How is content to be selected? How are teaching units to be organised and structured? No strategies for filtering content have been debated or suggested, it seems to me.

PRESSURES ON TEACHERS

I am sure too, that little attention has been given to providing teachers with extra time or money to develop the skills of curriculum development and that they are being asked to solve operational problems largely ignored by the NGCC and lacking their assistance. It is not enough to set out broad guidelines and set up local groups. Guidelines for curriculum unit construction needed to be given to the local groups as a necessary interconnecting device between broad aims and unit construction. McElroy's (1982) work too, reveals much about the complexities of the dynamics and work of local curriculum groups which as yet does not seem to be relevant to the New Zealand scene because perhaps the need for such knowledge has not yet been appreciated. I leave this area to one side as worthy of a paper in itself - a paper which would do much to raise consciousness and demonstrate the difficulties as well as the value of establishing local curriculum groups. I think lip service only has been given to the need for local networks and that assistance to this level of curriculum development has not yet reached take off stage in any large scale way.

PROVIDING CONTENT FILTERS AND STRUCTURE

Teachers probably perceive many difficulties besides the ones I identify but I want to concentrate attention on the immediate need to (1) provide more explicitly and fully, filters for selecting content and (2) devices for structuring syllabuses and units of work.

The general aim and objectives of Figure 2 seem to favour a people - environment approach to geography. In effect, a perspective of geography has been chosen which makes sense at a most general level. What is lacking in curriculum statements is a breakdown of this general view into more than very general components. What content filters have other curriculum developers chosen? GYSL chose for example the themes of Cities and People, Man, Land and Leisure and People, Place and Work as focus for selection. Note that topics do not stand alone as they do in the New Zealand syllabus. Geography 16-19 has chosen the themes of Natural Environments - The challenge for man, Use and misuse of natural resources, Man-Environment issues of global concern, and Managing man-made environments and systems. It is a simple but neglected matter for the NGCC to choose or negotiate the choice of themes or content filters for New Zealand. Teachers as teachers and as curriculum developers would then have something more on which to focus thoughts and planning.

Let us next be conscious of what for example, Geography 16-19 did in relation to their themes. They broke them down into further more finely meshed filters so that for example, under Use and Misuse of Natural Resources we have - The Energy Question, Water for Man, Minerals for Man, Land as a Resource, Soils and the Future, Managing Woodland and Forest and Potential of Oceans and Seas. It is not hard to detect coherence. I react against some of the man dominated vocabulary but the curriculum planning principle is clear. The process of selection becomes guided and manageable.

The modules or teaching units are then all structured on a common curriculum building basis, through the route for enquiry which the project team defined. The route for enquiry and unit construction poses key questions, What? Why? How? and How Ought? By identifying issues at the heart of the selected themes and asking such questions as What is the issue? What is the problem? Why is there a problem? How can it be resolved? What are the consequences of the solution? What ought to happen? teachers have a structure for organising content and learning experiences.

There is no need to outline 16-19 strategies further except to state that they exist for further inspection and that it seems to me that posing questions (Slater, 1976) has always been a very valuable and logical device for what amounts to selecting content at the classroom level of planning and organising.

CONCLUSION

In the process of translating curriculum theory into practice, it would seem that those managing the co-ordination of the geography curriculum have neglected to set out guidelines for a disciplined structuring of units of works. Much of value has been achieved which is in danger because the hierarchy inherent in the curriculum planning process has not been respected. O'Malley seems to be right when he suggests teachers have not been given help in fitting the jigsaw together. A document guiding unit construction at the school level could do this through a common approach to all units.

In addition, this paper has raised the possibility that within the wider context of the history/geography/social studies curriculum; geography needs to respond even more sensitively to a people and society orientation if it is to be fully congruent with the overall aims of the New Zealand education system.

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